

**STATION ACCESS MODULE IN  
CONJUNCTION WITH THE  
*QUANTAR/QUANTRO* STATION  
PLATFORM**

**FIELD PROGRAMMER**

**USER REFERENCE MANUAL**



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# 1. INTRODUCTION

## 1.1. Application

This Radio Service Software (also referred to as “Field Programmer” or “the program”) provides you with the ability to review and change the Repeater Access personality of the SAM board used with the *QUANTAR* or *QUANTRO* station using a standard 8086–80486 processor-based computer.

The next section of this manual – “GETTING STARTED” – guides you through the process of installing the software. A description of the overall philosophy of the Radio Service Software is given – including how the screens are formatted, and the method of navigating between the different screens.

The remaining sections of this manual are grouped in the same logical structure as the Radio Service Software itself, starting with the MAIN MENU, the base screen from which all other functions are selected.

\*\*\* WARNING \*\*\*

It is the responsibility of the user not to violate any FCC regulations or authorizations covering the operation of any MOTOROLA product.

## 1.2. Radio Service Software Acronyms and Abbreviations

<b>AMSS</b>	Automatic Multiple Site Selection
<b>ASCII</b>	American Standard Code For Information Interchange
<b>ASE</b>	Area Systems Engineer
<b>CH, CHAN</b>	Channel
<b>CIF</b>	Customer Information Form
<b>COAM</b>	Customer Owned and Maintained
<b>COM</b>	Communications Port
<b>CONF, CONFIG</b>	Configuration
<b>CONV</b>	Conversation
<b>CONV</b>	Conventional
<b>COSC</b>	Company (Motorola) Owned Service Center
<b>CP</b>	Codeplug
<b>CPD</b>	Communications Parts Division
<b>CSP</b>	Communications Systems Products
<b>DEC</b>	Decode
<b>DOS</b>	Disk Operating System
<b>DOS</b>	Data Operated Squelch
<b>DTMF</b>	Dual Tone Multi–Frequency
<b>EOF</b>	End Of File
<b>ESC</b>	Escape
<b>FCM</b>	Field Code Management
<b>FREQ</b>	Frequency
<b>FTR</b>	Field Technical Representative
<b>GRP</b>	Group
<b>ID</b>	Identification
<b>INDIV</b>	Individual
<b>kHz</b>	Kilohertz
<b>LAS</b>	Local Assignment System
<b>LED</b>	Light Emitting Diode
<b>MHz</b>	Megahertz
<b>LOC PTT</b>	Local Push To Talk
<b>MRSS</b>	Motorola Radio Service Software



<b>MSS</b>	Motorola Service Station
<b>NSO</b>	National Service Organization
<b>NST</b>	National Service Training
<b>OFP</b>	On—Line Field Programming
<b>PAC—RT</b>	Portable Area Communications Repeater
<b>PC</b>	Personal Computer
<b>PERS</b>	Personality
<b>PgDn</b>	Page Down
<b>PgUp</b>	Page Up
<b>P/N</b>	Part Number
<b>PROM</b>	Programmable Read—Only Memory
<b>PSB</b>	Product Service Bulletin
<b>PTT</b>	Push—To—Talk
<b>RAM</b>	Random Access Memory
<b>RESP</b>	Response
<b>RSS</b>	Radio Service Software
<b>Rx</b>	Receive
<b>SAF</b>	System Authorization File
<b>SAM</b>	Station Access Module
<b>SMR</b>	Specialized Mobile Radio
<b>S/N</b>	Serial Number
<b>SP</b>	Special Product
<b>SRN</b>	Service Repair Note
<b>TCMS</b>	Trunking Code Management System
<b>TOT</b>	Time Out Timer
<b>Tx, XMT</b>	Transmit

### 1.3. Required Equipment

1.8086–80486 processor-based computer equipped with 512K bytes available RAM (minimum), and an RS–232 Asynchronous Serial Communications Adapter.

2.PCDOS<sup>tm</sup> Version 3.1 or later, or MSDOS<sup>tm</sup> version 3.1 or later.

3.Software Licensing Package RPX–4719C

4.Radio Service Software –  
two 5.25 in Disks and one 3.5 in Disk RVN–4110A

5.RS232 Interface Cable (9 pin to 9 pin) 30–80369E31

#### **The Following Is Recommended But Not Required:**

6.Smart Wildcard Manual 68P81087E60–A

### 1.4. Software Rights Notice

This Motorola Product contains a copy of one or more items of Radio Service Software computer program(s) and may contain documentation and material provided by Motorola in connection with the Radio Service Software computer program(s) (“The Software”). The use of the software is governed by a License which has been granted to the software purchaser (“Licensee”) under the terms and conditions of the Radio Service Software License Agreement (“License Agreement”) entered into between Licensee and Motorola.

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### 1.5. Computer Software Copyrights

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## 2. GETTING STARTED

### 2.1. Connecting to the SAM board

Connect the PC to the RS232 port on the SAM board as shown in Figure 2.1. Cabling diagrams are located in Appendix E.

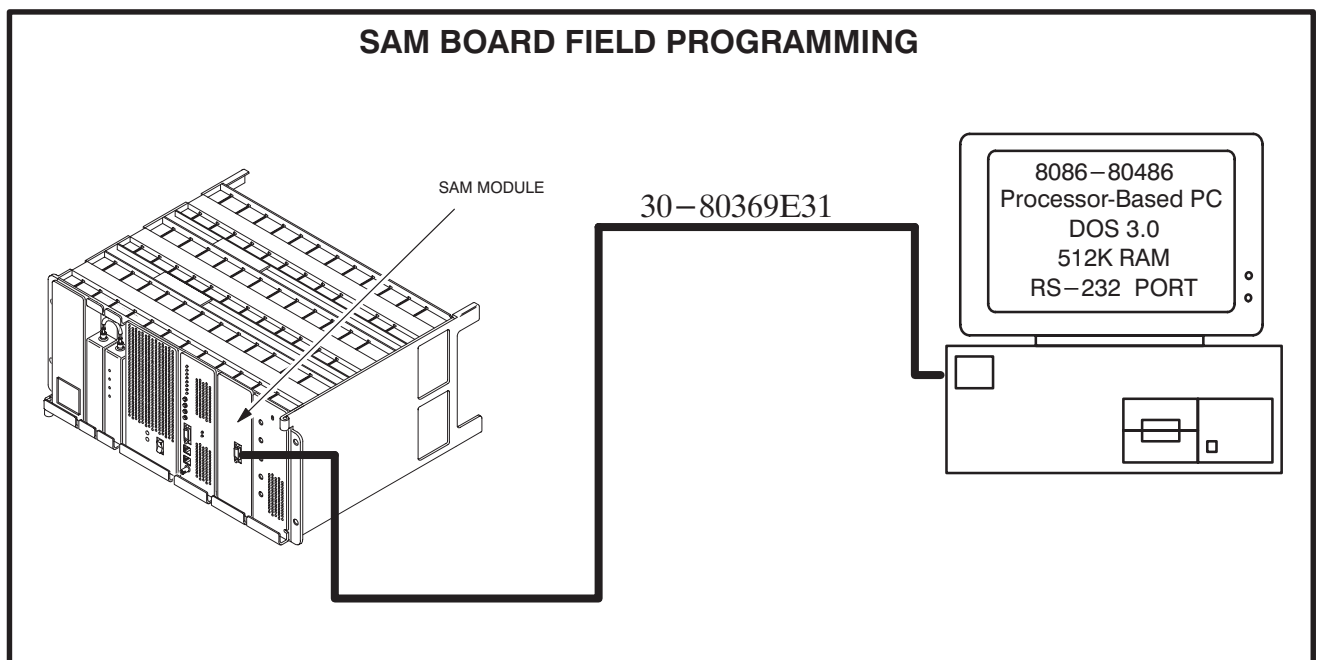


Figure 2.1: Sam Board Computer Configuration

**NOTE:** When programming a SAM board DO NOT disconnect the board from the PC at any time. Disconnecting the PC may leave the board inoperable. The only recommended time to disconnect is at the MAIN MENU screen.



## 2.2. Software Installation

The Radio Service Software is shipped on both 5.25 and 3.5 inch floppy disk formats. The following files are included in the package:

SAM.EXE	Part of the program's executable file.
SAM.HLP	The HELP file for the program's screens.
SAM.DAT	A text file containing most of the program's text information.
RAC.DEF	A default Codeplug setup for use in a station with only MDC decoding for Repeater Access.
DUALRAC.DEF	A default Codeplug setup for use in a station with MDC and single tone decoding, for Repeater Access.
RAC2RCVR.DEF	A default Codeplug setup for in a station with two receivers. Special programming controls the operation of 3 relays to be used in conjunction with a single duplexer.

### 2.2.1. Hard Disk Installation

To install the RSS on your hard disk, insert either the 3.5 inch or one of the 5.25 inch floppy disks into your computer's disk drive and type the following (If your floppy drive is designated by other than A:, exchange A: for the correct designator):

```
C:
CD\
MD MRSS
CD MRSS
MD SAM
CD SAM
COPY A:*. *
```

If installing from the 5.25 inch floppy disk, replace it with the remaining 5.25 inch disk then type the following:

```
COPY A:*. *
```

Note that directory names must be 8 characters or less. If a directory name longer than 8 characters is entered, DOS will truncate the name to the first 8 characters entered.

## 2.3. Screens and Function Keys

Every action of the Radio Service Software is controlled through the use of formatted screens and function keys. The four different types of screens are Banner Screen, Menu Screen, Data Entry Screen and Help Screen. The function keys are the ten keys located on the left side or along the top of the keyboard, labeled F1 to F10.

The Banner Screen is shown in Figure 2.6. The remaining screen types are divided into four windows. Window 1, the upper left window, presents the name of the program, the title of the current screen, and the page number. Window 2, the upper right window, instructs the operator on the type of input to which the programming software will respond. For example, window 2 may state “Select Function Key F1 – F10” or window 2 could read “Use UP / DOWN Arrows To Adjust Value”. This window may also contain error and status messages. Window 3, the large center window, and window 4, the bottom window, are different for Menu Screens, Data Entry Screens and Help Screens and will be described in the following sections.

### 2.3.1. Menu Screens

<b>MOTOROLA RADIO SERVICE SOFTWARE</b> <b>SAM with QUANTAR/QUANTRO</b> (1)	<b>SELECT FUNCTION F1 – F10</b> (2)
<div style="text-align: center;"><b>MAIN MENU</b></div> <div> F1 – HELP  F2 –  F3 – GET / SAVE / PROGRAM CODEPLUG DATA  F4 – CHANGE/VIEW CODEPLUG DATA  F5 –  F6 – (3)  F7 –  F8 –  F9 – SETUP COMPUTER CONFIGURATION  F10 – EXIT TO DOS </div>	
(4)	

Figure 2.2: Sample Menu Screen (Main Menu)

Window 3 on Menu screens is the menu window. This window presents choices to select with function keys. The function key number is followed by a description of the type of activity that can be accessed by pressing that key. Note that on all menu screens, the F1 function key is always a HELP function, and the F10 function key is always an EXIT key. The help function provides information on how to use the currently displayed screen, and the EXIT function will return you to the previous menu screen. Window 4 on Menu screens is not used.

### 2.3.2. Data Entry Screens

The DATA ENTRY SCREEN will request data that you must enter through the keyboard. On each screen, there may be a number of DATA ENTRY FIELDS. The current DATA ENTRY FIELD is highlighted. If the instruction window requests an entry, simply type the requested data to the DATA ENTRY FIELD. If a typing error occurs, move the cursor under the error with the left and right arrow keys and type over the error. Other times, you may be requested to use the up and down arrow keys to choose from a number of predetermined selections. To move to the next DATA ENTRY FIELD, press either ENTER or the TAB key. The TAB key may also be used to move down to a desired DATA ENTRY FIELD while the BACK TAB (SHIFT TAB) key may be used to move up to a desired DATA ENTRY FIELD.

In data entry screens, window 3, the large center window, is where the data is displayed, and window 4, the bottom window, displays a list of the available function keys (F1 – F10) for that data.

#### Data Entry Screens Key Summary

(Key)	(Action)
▶	Right Arrow moves cursor right
◀	Left Arrow moves cursor left
▲	Up Arrow changes the current Data Entry Field to the previous selection in a list of predetermined choices on DATA ENTRY SCREENS.
▼	Down Arrow changes the current Data Entry Field to the next selection in a list of predetermined choices on DATA ENTRY SCREENS.
PgUp	Displays the previous page of information on the DATA ENTRY SCREENS.
PgDn	Displays the next page of information on the DATA ENTRY SCREENS.
< – (Enter)	Enters data typed and moves to next Data Entry Field
– – >	Forward Tab moves to the next Data Entry Field.
< – –	Back Tab moves to the previous Data Entry Field. This may be Shift Tab on some machines.

### 2.3.3. Help Screens

Help Screens are available by pressing the F1 function key from both Menu screens and Data Entry screens. When pressing F1 from a Menu screen, help for the current menu is displayed. When pressing F1 from a Data Entry screen, a description of the current data entry field is displayed. An example of help from a Menu screen is shown in Figure 2.3.

<b>MOTOROLA RADIO SERVICE SOFTWARE</b> <b>SAM with QUANTAR/QUANTRO</b>					<b>PRESS F10 TO RETURN TO MENU</b>				
<b>INDIVIDUAL SCHEMES: HELP</b>									
<p>DECODE TABLE</p> <p>This screen displays the decoder schemes. The scheme choices are highlighted via the Up/Dn arrow keys or Tab/Shift Tab keys. Upon pressing the Enter key, editable and non-editable information will be displayed for that scheme. CUSTOM is the only scheme that is completely editable.</p>									
F1	F2 KEYBOARD HELP	F3	F4	F5	F6	F7	F8	F9 STATUS HELP	F10 EXIT HELP

Figure 2.3: Sample Help Screen

The Help information is displayed in window 3, and window 4 contains a list of the possible functions. The functions available from a Help screen are listed below.

- F2 – Keyboard Help – Describes cursor control
- F9 – Status Help – Displays RSS version number, part number, manual number, release date, and Firmware Upgrade Kit number. (see Figure 2.4).
- F10 – Exit Help (to previous section)



<b>MOTOROLA RADIO SERVICE SOFTWARE</b> <b>SAM with QUANTAR/QUANTRO</b> <b>&lt;CURRENT SCREEN NAME&gt; :HELP</b>	<b>PRESS F10 TO RETURN TO MENU</b>										
<p style="text-align: center;"><b>STATUS HELP</b></p> <p>RSS Software Version . . . . R01.01</p> <p>Release Date . . . . . 7 JAN 1993</p> <p>Part Number. . . . . RVN – 4110A</p> <p>Manual Number. . . . . 68P80309E35 – O</p>											
<table><tr><td>F1</td><td>F2</td><td>F3</td><td>F4</td><td>F5</td><td>F6</td><td>F7</td><td>F8</td><td>F9</td><td>F10 EXIT</td></tr></table>		F1	F2	F3	F4	F5	F6	F7	F8	F9	F10 EXIT
F1	F2	F3	F4	F5	F6	F7	F8	F9	F10 EXIT		

Figure 2.4: Status Help Screen



### 2.3.4. How the Screens Are Organized

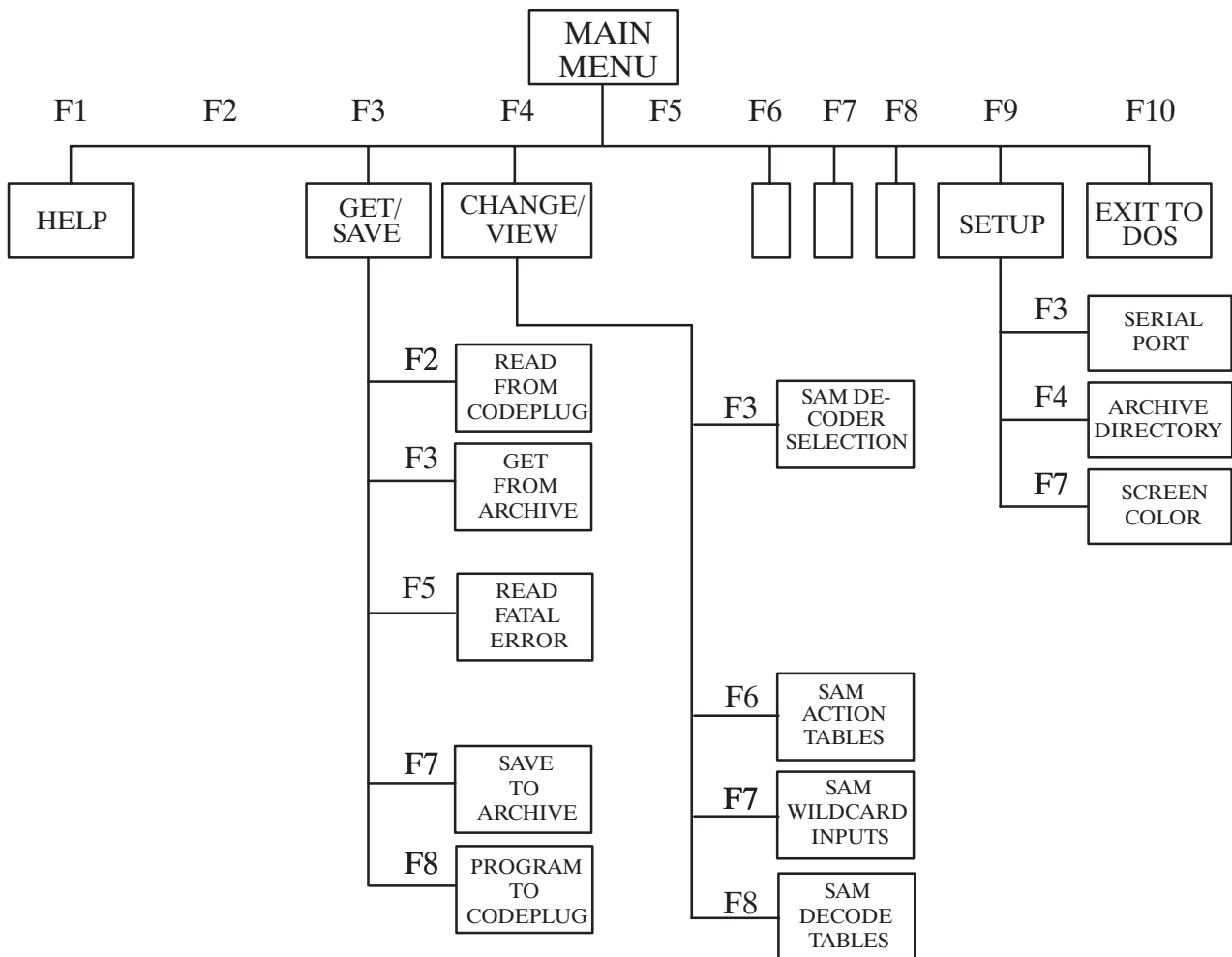


Figure 2.5: Screen Organization



## 2.4. How to Start the Radio Service Software

After installing the Radio Service Software on a hard drive (see Section 2.2.), move to the SAM directory by typing at the DOS prompt:

```
CD C:\MRSS\SAM <—
```

To start the Radio Service Software, type:

```
SAM <—
```

If the program has been configured (i.e. SAM.CFG file exists) the Banner Screen (Figure 2.6) will be displayed. Pressing any key will display the MAIN MENU. If this is the first time the program has been used, or the file SAM.CFG does not exist, then the program will respond with the COMPUTER CONFIGURATION MENU (Figure 2.7). The COMPUTER CONFIGURATION MENU is described in the next section.

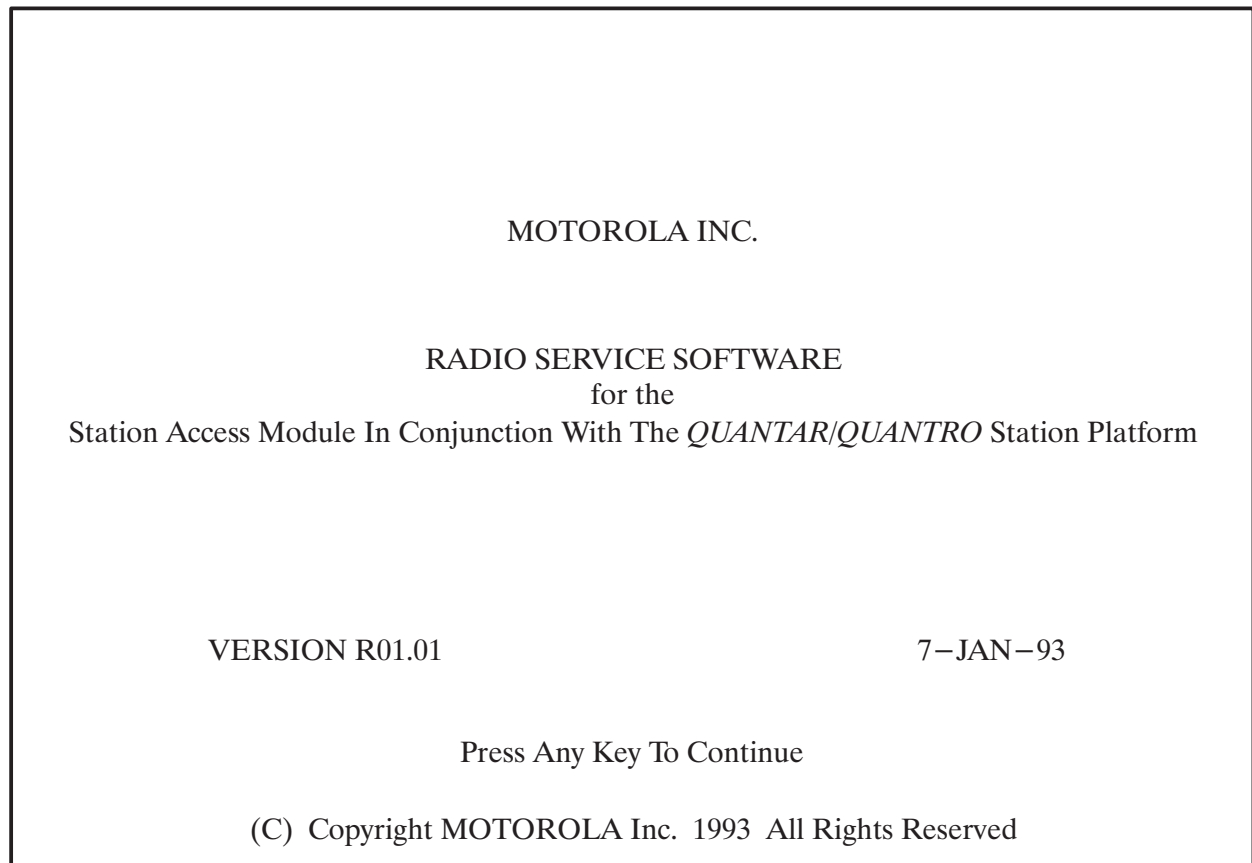


Figure 2.6: Banner Screen



## 2.5. Configuring the Computer

The COMPUTER CONFIGURATION MENU (Figure 2.7) has five active function keys. F1 is for Help, F3 is for setting up your serial port, F4 is for setting up default directories, F7 is for setting your display to monochrome or color and F10 will return the user to the main menu. This screen will automatically appear if the file SAM.CFG does not exist when the RSS is started.

<b>MOTOROLA RADIO SERVICE SOFTWARE</b> <b>SAM with QUANTAR/QUANTRO</b>	<b>SELECT FUNCTION KEY F1 – F10</b>
<b>COMPUTER CONFIGURATION</b>	
<div><b>COMPUTER CONFIGURATION MENU</b>  F1 – HELP F2 – F3 – Serial Port Configuration F4 – Directory Configuration F5 – F6 – F7 – Screen Color Configuration F8 – F9 – F10 – Exit to Main Menu</div>	

Figure 2.7: Computer Configuration Menu

### 2.5.1. Serial Port Configuration (F3)

By pressing the F3 function key at the COMPUTER CONFIGURATION MENU, the computer will display the SERIAL PORT CONFIGURATION screen (see Figure 2.8). There may be from 1–4 (COM1 – COM4) Serial Ports on a PC. The Serial Port is used to transmit data back and forth to the SAM board. The Serial Port Configuration screen contains the following fields: Serial Port and Baud Rate. The <BACKTAB> key is used to move the cursor to the previous field. The <ENTER> and <TAB> keys are used to advance the cursor to the next field.

IF THE SERIAL PORT IS NOT SET CORRECTLY, YOU WILL GET A “SAM Does Not Respond” ERROR MESSAGE WHEN TRYING TO COMMUNICATE WITH THE SAM BOARD.

The Serial Port Configuration fields (see Figure 2.8), along with a brief explanation for each are shown below.

<b>MOTOROLA RADIO SERVICE SOFTWARE</b> <b>SAM with QUANTAR/QUANTRO</b>					<b>Use UP / DOWN Arrow Keys To Select</b>				
<b>SERIAL PORT CONFIGURATION</b>									
Serial Port					COM 1				
Baud Rate					1200				
F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
HELP							SAVE		EXIT

Figure 2.8: Serial Port Configuration Screen

#### Serial Port

The Serial Port field indicates to which Serial Port on the PC that the SAM board is connected. The four choices, COM1, COM2, COM3, and COM4, are selected by use of the Up/Down arrow keys. The default is COM1.

## Baud Rate

The Baud Rate field is the rate of transmission between the SAM board and the computer. Baud Rate is expressed in bits-per-second (bps). The five choices 0300, 1200, 2400, 4800 and 9600 are selected by use of the Up/Down arrow keys. The default is 1200 bps.

### 2.5.1.1. Definition of Serial Port Configuration Function Keys

F1 – Provide HELP associated with the Serial Port Configuration screen.

F8 – Save the current Serial Port Configuration to the ‘SAM.CFG’ file.

F10 – Exits the Serial Port Configuration screen.

### 2.5.2. Directory Configuration (F4)

By pressing the F4 function key at the COMPUTER CONFIGURATION MENU, the computer will display the DIRECTORY CONFIGURATION screen (Figure 2.9). The Archive, Help and SAM.DAT Directories can be set here. A valid entry must be made before exiting. To save the selections press F8. Pressing the F10 function key will return you to the COMPUTER CONFIGURATION MENU, but will not save your selections to disk.

<b>MOTOROLA RADIO SERVICE SOFTWARE</b> <b>SAM with QUANTAR/QUANTRO</b>		<b>Please Enter a Directory Pathname</b> <b>EXAMPLE: C:\SAM</b>	
<b>DIRECTORY CONFIGURATION</b>			
Archive File Directory:		C:\MRSS\SAM\ARCHIVE	
Help File Directory:		C:\MRSS\SAM	
SAM.DAT File Directory:		C:\MRSS\SAM	
F1 HELP	F2	F3	F4
F5	F6	F7	F8 SAVE
F9	F10 EXIT		

Figure 2.9: Directory Configuration Screen

The Archive File Directory is the directory in which all codeplug files should be stored. The directory that is entered here will also appear automatically in the read and save to disk screens. This directory

may be changed either on the above screen or within the read/save to disk screens. If the directory is changed from the read/save to disk screens, that directory will only automatically appear during the current working session. If the directory is changed from the configuration screen and saved, then that directory will appear even after the PC has been re-booted.

The Help File directory is the directory in which the file SAM.HLP exists. If this directory is incorrectly set, the user will be prompted to enter a valid directory where the help file does exist.

The SAM.DAT file directory is the directory in which the SAM.DAT file exists. This file contains all of the text that is displayed on the data entry screens. Upon starting the program, this file is loaded into memory, and if the file cannot be found, a screen prompting the user for the correct directory will appear.

2.5.3. Configuring the Screen (F7)

Pressing the F7 function key at the COMPUTER CONFIGURATION MENU will display the COLOR CONFIGURATION screen (Figure 2.10). The highlighted field will be the MONITOR TYPE field. If using a color display, then this field should be set to “COLOR” using the up/down arrows. If using a monochrome display, this field should be set to “MONO”, and no other fields will appear on the screen. If the color display is enabled, you may now change the colors of various sections of the display using the Up/Down Arrow keys. Move from section to section by using the TAB or ENTER keys. To save your selections, press the F8 function key. If you do not like your selections, you can start over by pressing the F9 function key and the screen will return to its original values. Pressing the F10 function key will return you to the COMPUTER CONFIGURATION menu, but if you did not save your selections, using the F8 function key, your selections will not be saved.

MOTOROLA RADIO SERVICE SOFTWARE SAM with QUANTAR/QUANTRO SCREEN COLOR					Use UP / DOWN Arrows To Select Press Enter To Move To Next Field				
SCREEN COLOR CONFIGURATION									
MONITOR TYPE .....					COLOR				
Text .....					Yellow				
Status Line .....					White				
Message Line .....					White				
Highlight .....					White				
Background .....					Blue				
Screen Outline .....					Lt. Red				
F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
HELP					SAVE		ORG. VALUES		EXIT

Figure 2.10: Color Configuration Screen

2.5.4. Exiting the Configuration Screens (F10)

When you are through with the configuration screens, pressing F10 COMPUTER CONFIGURATION MENU will move you to the Banner Screen (Figure 2.6). The next time the RSS is run the COMPUTER CONFIGURATION menu will be bypassed and the program will start from the Banner Screen. If at a later time you wish to change the configuration, you may do so from the COMPUTER CONFIGURATION menu via the MAIN MENU (Figure 2.2).



## 2.6. Main Menu

The Main Menu (See Figure 2.2) is the fundamental screen of the Field Programmer. All functions of the Field Programmer are accessed via this menu. This section briefly describes the operation of each of the five functions available at the main menu. The functions of the F3 and F4 keys are described in detail in Sections 3 and 4 respectively. The detailed description of the F9 key was discussed in Section 2.5.

<b>MOTOROLA RADIO SERVICE SOFTWARE</b> <b>SAM with QUANTAR/QUANTRO</b>	
<div style="text-align: center;"><b>MAIN MENU</b></div> <div> F1    – HELP  F2    –  F3    – GET / SAVE / PROGRAM Codeplug Data  F4    – CHANGE / VIEW Codeplug Data  F5    –  F6    –  F7    –  F8    –  F9    – SETUP Computer Configuration  F10  – Exit to DOS </div>	

Figure 2.11: Main Menu

### 2.6.1. Help (F1)

The F1 key provides context sensitive help whenever it is pressed in the program. The help displayed depends upon what screen was currently active. Since the help key is a constant throughout the RSS, it is not discussed in further sections. For more information on help screens, see Section 2.3.3.

### 2.6.2. Get / Save / Program Codeplug Data (F3)

All of the personality for a SAM board is stored on EEPROM. This EEPROM is called a Codeplug. The Codeplug data is initially programmed by the factory.

This Radio Service Software has the capability to transfer the codeplug data to a disk file, which is called an archive file. **IT IS RECOMMENDED THAT WHEN A SAM BOARD IS FIRST RECEIVED, ITS CODEPLUG DATA BE STORED ON A DISK FILE AS A BACK-UP.** This way, if the memory of the SAM board should ever fail, the disk will provide a quick means of retrieving any lost information, which can then be transferred back into the SAM board.

From this menu, the user may read codeplug data from the SAM board or disk to the computer. This function **MUST** be done before any changes can be made to the personality. The user may also save the codeplug data to the SAM board or disk from this menu. This is the **ONLY** time the personality of the SAM board is changed. It is also recommended that the new codeplug information be stored on a disk for future work on this SAM board. For more detailed information on these functions, see Section 4.

### **2.6.3. Change / View Codeplug Data (F4)**

This function allows the personality of the SAM board to be changed. It must be remembered that “F4 – CHANGE / VIEW Codeplug Data” is only working on an image of the codeplug. Use “F3 – GET / SAVE / PROGRAM Codeplug Data” to change the actual SAM codeplug. For more detailed information on these functions, see Section 5.

### **2.6.4. Setup Computer Configuration (F9)**

This function allows you to change your serial ports, directories and screen colors as described earlier on the COMPUTER CONFIGURATION menu (Figure 2.7). These may be changed at any time by pressing F9 from the main menu. If the file SAM.CFG does not exist then this screen will appear upon starting the field programmer before the banner screen is displayed (See Section 2.5.).

### **2.6.5. Exit to DOS (F10)**

This function allows you to cleanly exit the program and return to the Disk Operating System (DOS). When F10 is pressed, another window will appear asking the user if they really want to exit to DOS. F2 must be depressed to actually exit to DOS, and F10 cancels the exit. This change in function keys is intentionally done to avoid the inadvertent loss of data that might come with being accustomed to using the F10 function key to move up the RSS hierarchy of menus. Since the exit (or return) key is a constant throughout the RSS, it is not discussed in further sections.

### 3. GET / SAVE / PROGRAM MENU (F3)

<b>MOTOROLA RADIO SERVICE SOFTWARE</b> <b>SAM with QUANTAR/QUANTRO</b>	
<b>GET/SAVE/PROGRAM CODEPLUG DATA</b>	
<p style="text-align: center;"><b>GET / SAVE / PROGRAM MENU</b></p> <p> F1    – HELP  F2    – Read Data From Codeplug  F3    – Get Codeplug Data From Archive Disk File  F4    –  F5    – Read SAM With Fatal Error  F6    –  F7    – Save Data to Archive Disk File  F8    – Program Data Into Codeplug  F9    –  F10   – Exit to Main Menu </p>	

Figure 3.1: Get/Save/Program Menu

Pressing F3 at the MAIN MENU will display the Get/Save/Program menu (Figure 3.1). The Get/Save/Program menu has six functions available, which are shown in the Figure above. Each of these functions are described in detail in the following sections.

The personality data is read when the F2 function key is pressed (a read function is performed). F5 is pressed to read the personality data from the SAM, when the SAM does not respond to pressing the F2 function key. Pressing F5 causes the SAM to cease normal operation during the read procedure. When the F8 function key is pressed (a program function is performed) the personality data is updated.

Similarly, the personality data is saved or retrieved from the the archive disk file if the F7 or F3 function keys are pressed, respectively.

3.1. Read Data from a Codeplug (F2)

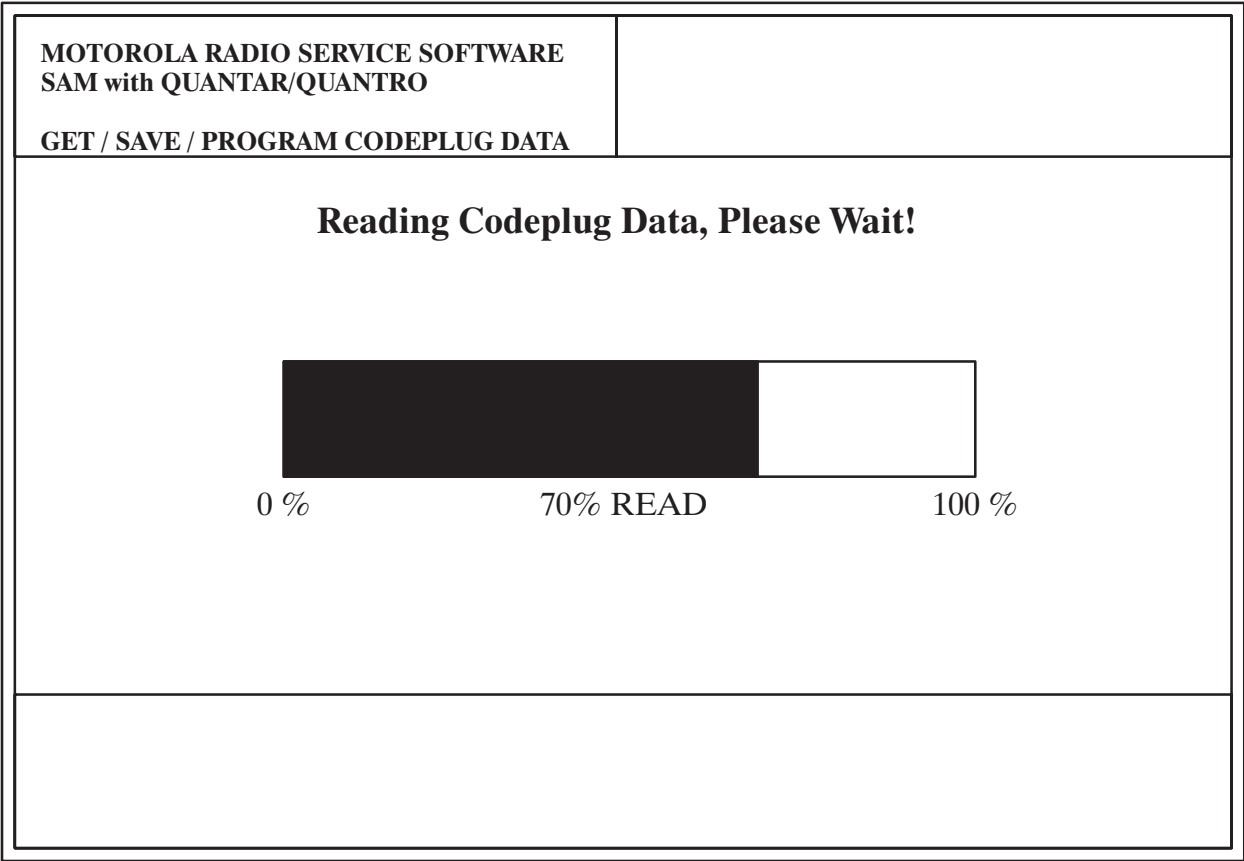


Figure 3.2: Reading Data from a Codeplug

Pressing F2 or F5 in the Get/Save/Program menu brings the user to the screen in Figure 3.2. If the codeplug data has not yet been read, it will read up to the 100% mark. If the codeplug has already been read, a popwarning appears asking you to press F2 to continue reading (Note: This will overwrite existing data) or press F10 to cancel the read and return to GET/SAVE/PROGRAM menu. A popwarning appears if the SAM board is not connected or if there is a problem reading the data. If this occurs, press F10 to return to the previous menu.

Note: If a popwarning appears after the read is completed which says “Codeplug Data has been Corrupted” then contact Product Services or read the appropriate default Archive Disk File and reprogram the SAM board.

### 3.2. Get Codeplug from an Archive Disk File (F3)

<b>MOTOROLA RADIO SERVICE SOFTWARE</b> <b>SAM with QUANTAR/QUANTRO</b>					<b>Enter Filename Or Use These Keys</b> <b>Up/Dn Arrow, PgUp/PgDn, Tab, Shift Tab</b>				
<b>GET CODEPLUG DATA</b>									
Enter Directory Name:			<b>C:\MRSS\SAM\ARCHIVE</b>						
Enter File Name:			<b>RAC.DEF</b>						
<b>RAC.DEF</b>									
<b>DUALRAC.DEF</b>									
<b>RAC2RCVR.DEF</b>									
F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
HELP									EXIT

Figure 3.3: Getting Codeplug from an Archive Disk File

Pressing F3 from the menu in Get/Save/Program Menu (Figure 3.1) will bring up the Get Codeplug Data from an Archive Disk File screen (Figure 3.3). This screen will first prompt the user for a valid directory. If an invalid directory is entered the directory will be set to the root directory. Note that the user must enter a valid drive letter as part of the directory name. After a valid directory has been entered, the files in that directory will be displayed on the screen. A maximum of 200 files can be displayed. A maximum of 30 files can be displayed on a page. To view other pages (if they exist) use the Pg Up / Pg Down keys.

**Note:** The user sets up C:\MRSS\SAM\ARCHIVE during the recommended installation procedure found in Chapter 2. This is the directory that should be used to store all codeplug files.

Enter the desired filename after the files are displayed (in above figure the RAC.DEF filename has been entered) or use the Tab, Shift Tab or Up/Down arrow keys to move the cursor onto the file required. When a file is highlighted, its name will appear simultaneously in the File Name field. To enter the file name, press the return key. To view a different directory, Shift Tab up to Directory Name field and enter new directory to view. Upon entering a valid filename a screen similar to that in



Figure 3.2, Reading Data from a Codeplug, will appear. Control will be transferred to the menu in Figure 3.1, Get/Save/Program Menu, after the file has been successfully read.

If the codeplug data has already been read, a popwarning will appear asking if you wish to overwrite the current codeplug. Pressing F2 allows the user to continue, pressing F10 cancels the read and returns the user to the Get/Save/Program Menu (Figure 3.1).

Note: The filename that is entered must exactly match the filename of the file that is to be read. The following are examples of valid filenames:

388CPY12.34A  
RAC.DEF

### 3.3. Save Codeplug to an Archive Disk File (F7)

<b>MOTOROLA RADIO SERVICE SOFTWARE</b> <b>SAM with QUANTAR/QUANTRO</b>					<b>Enter Filename Or Use These Keys</b> <b>Up/Dn Arrow, PgUp/PgDn, Tab, Shift Tab</b>				
<b>SAVE CODEPLUG DATA</b>									
Enter Directory Name:					C: \MRSS\SAM\ARCHIVE				
Enter File Name:					RAC.DEF				
RAC.DEF									
F1 HELP	F2	F3	F4	F5	F6	F7	F8	F9	F10 EXIT

Figure 3.4: Saving Codeplug to a Disk File

Pressing F7 from the menu in Get/Save/Program Menu (Figure 3.1) will bring up the Save Codeplug to a Disk File screen (Figure 3.4). The directory will initially be the same directory that was referenced in the Configuration screen, but may be changed if desired. After a valid directory has been entered, the files in that directory will be displayed on the screen. A maximum of 200 files can be dis-

played. A maximum of 30 files can be displayed on a page. To view other pages (if they exist) use the Pg Up / Pg Down keys.

Note: The user sets up C:\MRSS\SAM\ARCHIVE during installation. This is the directory that should be used to store all codeplug files.

Enter the desired filename after the files are displayed (in the above figure the filename RAC.DEF has been entered) or use the Tab, Shift Tab or Up/Down arrow keys to move the cursor on the file required. When a file is highlighted, its name will appear in the File Name field. To enter the file name, press the return key. By entering the directory and filename the user is able to make a copy of the codeplug. Upon entering a valid filename a screen similar to that in Figure 3.5 will appear. After the codeplug is saved the Get/Save/Program Menu (Figure 3.1) will reappear.

Note: The filename must be 8 characters or less otherwise it will be truncated. The following are examples of valid filenames:

388CPY12.34A  
RAC.DEF

If the filename already exists a popwarning will appear asking if the file is to be overwritten.

**\*\*\*\*\* WARNING \*\*\*\*\***

**ONCE THE FILE IS OVERWRITTEN THE ORIGINAL CANNOT BE RECOVERED!**

3.4. Program Data into Codeplug (F8)

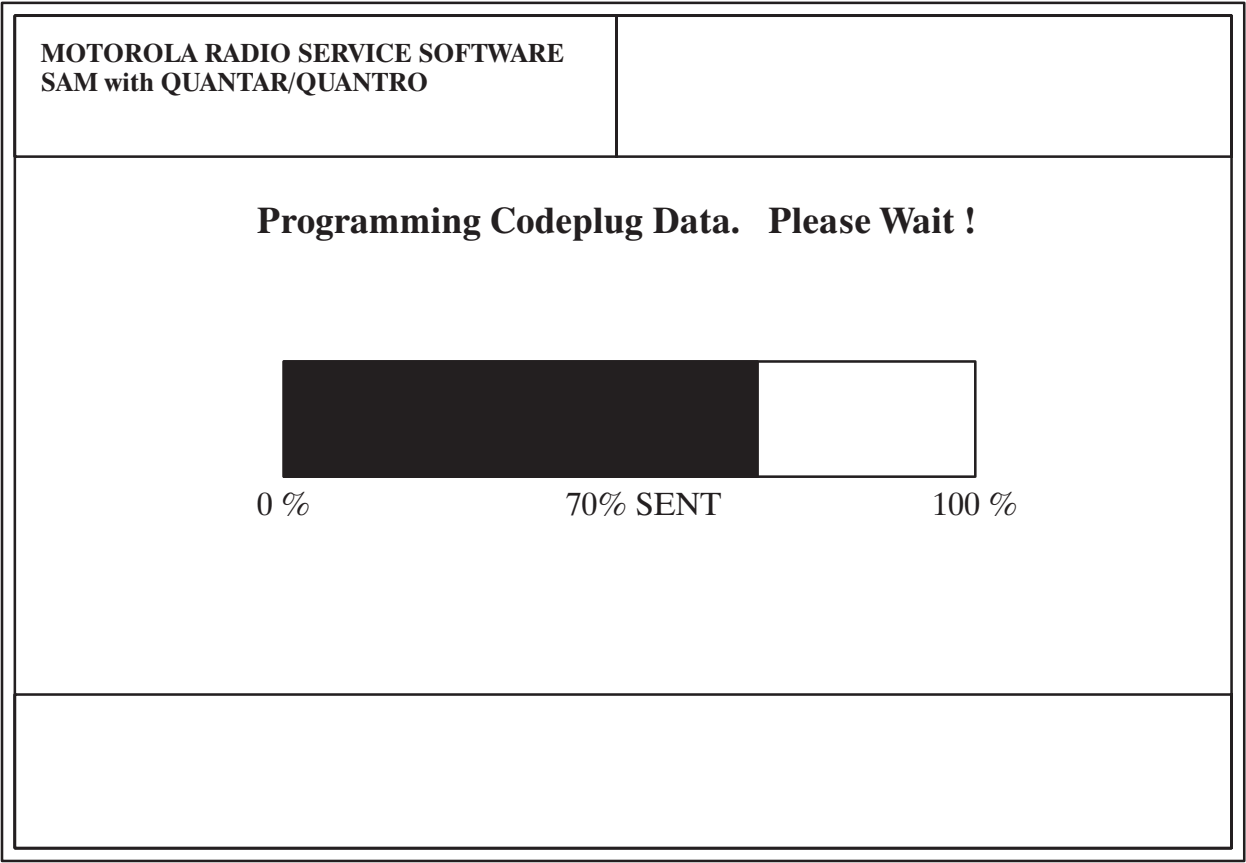


Figure 3.5: Programming Codeplug Data

Pressing F8 in the Get/Save/Program menu (Figure 3.1) brings the user to the Programming Codeplug Data screen (Figure 3.5).

A popwarning will arise if the SAM board is not connected or if there is a problem sending the data; in either case press F10 to return to the previous menu. After the EEPROM has been successfully programmed the program will return to the Get/Save/Program Menu (Figure 3.1).



## 4. CHANGE / VIEW CODEPLUG DATA (F4)

<b>MOTOROLA RADIO SERVICE SOFTWARE</b> <b>SAM with QUANTAR/QUANTRO</b>  <b>CHANGE / VIEW CODEPLUG DATA</b>	
<p style="text-align: center;"><b>CHANGE / VIEW CODEPLUG DATA MENU</b></p> <p>F1 – HELP</p> <p>F2 –</p> <p>F3 – SAM Decoder Selection</p> <p>F4 –</p> <p>F5 –</p> <p>F6 – SAM Action Tables</p> <p>F7 – SAM Wildcard Inputs</p> <p>F8 – SAM Tone Decoder Tables</p> <p>F9 –</p> <p>F10 – Exit to Main Menu</p>	

Figure 4.1: Change / View Codeplug Data Menu

### 4.1. Definition of Change/View Codeplug Data Menu Function Keys

Pressing F4 at the MAIN MENU will display the above menu. A SAM codeplug must be loaded into the programmer for this function to work. The Change/View Codeplug Data Menu has six functions available, which are shown in the Figure above. Each of these functions are described in detail in the following sections.

#### 4.1.1. Default Setups For SAM

The SAM RSS is shipped with three default codeplugs. These codeplugs allow Repeater Access with MDC1200 signalling, MDC1200 and Single Tone signalling, or operation of the SAM in a station with two receivers.

The default codeplug labeled **RAC.DEF** contains five Action Tables as shown below.

Action Table Number	01			Action Table #01 of 05
#	Action	Address	Targ Bit	Polarity
01	MANIBIT	004C	0	ENABLED

Action Table Number	02			Action Table #02 of 05
#	Action	Address	Targ Bit	Polarity
01	MANIBIT	004C	0	DISABLED

Action Table Number	03			Action Table #03 of 05
#	Action	Address	Targ Bit	Polarity
01	MANIBIT	004C	1	ENABLED

Action Table Number	04			Action Table #04 of 05
#	Action	Address	Targ Bit	Polarity
01	MANIBIT	004C	1	DISABLED
02	MANIBIT	004C	0	DISABLED

Action Table Number	05			Action Table #05 of 05
#	Action	Address	Targ Bit	Polarity
01	MANIBIT	004C	0	DISABLED
02	MANIBIT	004C	1	DISABLED
03	MANIBIT	004C	2	DISABLED
04	MANIBIT	004C	3	DISABLED
05	MANIBIT	004C	4	DISABLED
06	MANIBIT	004C	5	DISABLED
07	MANIBIT	004E	3	DISABLED
08	MANIBIT	004E	4	DISABLED

Action Tables 1 and 2 are required to allow SAM to communicate with the station for the basic Automatic Repeater Access function. Action Table 1 provides the RPTR PTT qualifier RPT\_ACC\_EN (Enables Address 004C, Bit 0) to allow the station to repeat on receipt of the access code. Wildcard Input 8 and Action Table 2 allow the SAM board to monitor station RPTR PTT and remove the qualifier at the end of the conversation.

Action Table 3 provides the RPTR PTT qualifier RPTR\_EN on receipt of the Repeater Setup code. This will allow repeat without the Repeater Access code until the Knockdown code is sent.

Action Table 4 removes the RPTR PTT qualifiers RPTR\_EN and RPT\_ACC\_EN on receipt of the Repeater Knockdown code.

Action Table 5 returns bits 0 through 5 of address 004C and bits 3 and 4 of address 004E to their DISABLED polarities upon activation of Wildcard Input 15. Wildcard Input 15 becomes active upon a SAM reset.

**WARNING! Do not use or access address 004C Target Bit 02 because it is used for internal diagnostics!!**

To use these action tables with MDC1200 signalling, the Wildcard Inputs and the Decoder Selection screens are to be setup as shown below.

### SAM WILDCARD INPUTS

WILDCARD INPUT	INPUT TYPE	ACTIVE	ACTIVE ACT TBL	INACTIVE ACT TBL
8	WILDCARD	LOW		02
15	WILDCARD	LOW	05	

### DECODER SELECTION

BINARY DECODER BINARY INPUT	MDC1200 RECEIVER 1	SAM MODE #01 of 01
--------------------------------	-----------------------	--------------------

BINARY DECODER TARGET#	OPCODE	ID	ACT TBL
01	REPEAT ACC	0000	01
02	REPEAT ACC	0001	03
03	REPEAT ACC	0002	04

The default codeplug labeled **DUALRAC.DEF** allows for simultaneous decoding of MDC1200 and Single Tone for the purpose of Repeater Access. When a single tone of the proper frequency is decoded it is checked five times in modes 0 through 4 to reduce tone falsing before the repeater access is granted. Mode 5 is used when an MDC message is decoded for repeater access.

The minimum single tone duration permitted is 500 milliseconds. This duration allows SAM enough time to detect the tone on all 5 modes.

The minimum MDC Pre–time duration is 250 milliseconds.

The default codeplug labeled **RAC2RCVR.DEF** contains all of the functions of the dual decode codeplug. In addition, the SAM module has action tables 11–13 added to control 3 relays that allow the output of the station transmitter and the 2 receiver inputs to be coupled to a single duplexer. In the Standby Receive mode, both receivers are connected through the duplexer to the antenna. When the station has a channel 1 PTT, relay 1 is switched to allow for either operation as a Channel 1 repeater or a channel 1 full duplex base station. When a channel 2 PTT occurs, all 3 relays are switched and the station operates as a channel 2 simplex base station.

- **QUANTAR Antenna Relay Delay must be set to 150 milliseconds when using the RAC2RCVR.DEF file for two–receiver operation.**
- **The ID field contains 0000 as the default and must be programmed by the user to contain the correct MDC1200 ID for proper operation.**

## 4.1.2. SAM Decoder Selection (F3)

The SAM Decoder Selection Screens (Figure 4.2 – Figure 4.4) contain editable fields for the Station Access Module (SAM) mode. There is a maximum of 17 (0–16) SAM modes.

When deleting modes, it is necessary to also delete the ‘SELSAMODE’ actions in any SAM Action tables that reference the mode to be deleted (see Section 4.1.3.1.)

The <TAB> and <BACK TAB> keys are used to move the cursor through each field. The <ENTER> key is used to advance the cursor to the next target. The <PgUp> and <PgDn> keys are used to move the cursor between pages.

### 4.1.2.1. SAM Decoder Selection Definitions

The SAM Decoder Selection fields (see Figure 4.2 – Figure 4.4), along with a brief explanation for each, are discussed in this section.

<b>MOTOROLA RADIO SERVICE SOFTWARE</b> <b>SAM with QUANTAR/QUANTRO</b> <b>PAGE 1 Of 3</b> <b>SAM DECODER SELECTION</b>					<b>&lt;MESSAGE CORRESPONDS TO CUR- RENT FIELD&gt;</b>				
SAM MODE NUMBER      0					SAM MODE# 01 of 02				
TONE DECODER TONE INPUT			ZVEI RECEIVER 1						
TONE DECODER	TARGET#	TARGET	ACT TBL	GROUP	GR	TAR	GR	ACT TBL	
01 . . . . .	2345	01		S	--	GGG	01		
02 . . . . .	12XXX	03		E	--	G--	03		
03 . . . . .	EDCB	04		N	----		--		
04 . . . . .									
05 . . . . .									
06 . . . . .									
07 . . . . .									
08 . . . . .									
09 . . . . .									
10 . . . . .									
F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
HELP					ADD SAM MODE		ACTION EDIT		EXIT

Figure 4.2: SAM Decoder Selection Screen #1

### Tone Decoder

The Tone Decoder field indicates which Tone Decoder scheme will be used in the current SAM Mode. The Tone Decoder can only be set to a tone decoding scheme if the Binary Decoder and DTMF De-

coder are both DISABLED. The following Tone Decoder schemes may be toggled through by use of the Up/Down arrow keys.

ZVEI	ZVEI standard tone decoding scheme.
ZVEIFR	ZVEI French tone decoding scheme.
ZVEIMOD	ZVEI modified tone decoding scheme.
CCIR	CCIR standard tone decoding scheme.
CCIRMOD	CCIR modified tone decoding scheme.
EEA	EEA tone decoding scheme.
CUSTOM	Customized tone decoding scheme.
DISABLED	No tone decoder is used.

Some parameters for each of these schemes may be modified in the SAM Tone Decode screen (see Section 4.1.5.). If a valid Tone Decoder is entered and the SAM's Tone Decoder has decoded a message, it will compare this message against a list of user-programmable Tone Decoder Targets. If a match is found, the SAM board will execute one or more actions specified by the matching Tone Decoder Target's corresponding SAM Action Table number. If the Tone Decoder field is set to DISABLED or changed then all of the fields associated with the Tone Decoder will be cleared.

### **Tone Input**

The Tone Input field specifies which input the SAM binary decoder will monitor. This field is non-editable at this time and displays RECEIVER 1.

### **Tone Decoder Target**

A Tone Decoder Target is a sequence of tones that must be matched to execute a SAM Action Table. There can be a maximum of 10 Tone Decoder Targets for the Tone Decoder. A Tone Decoder Target consists of the following fields: TARGET, ACT TBL (Action Table), GROUP, GR TAR (Group Target) and GR ACT TBL (Group Action Table).

### **Target**

The Target field defines the sequence of tones that must be matched to execute the SAM Action Table. Each tone in the sequence is specified as a hex number (0 – E), which corresponds to a particular frequency for the current tone decoder signalling scheme. This correspondence is defined in the SAM Tone Decode screen (see Section 4.1.5.). Each Target is allowed a maximum of seven tones. Wildcards are allowed in place of a specific tone and are indicated by an 'X'. The SAM Tone Decoder will interpret a 'X' as a match for any tone number. For example, the sequences '12345' and '12045' will both match the target '12X45'. To clear the rest of the Tone Decoder Target# fields it is only necessary to clear the Target field.

Note: The order of the Targets is important; longer Targets come first in the list. The field programmer will automatically sort the Targets by length.

### **Act Tbl (Action Table)**

The Action Table field specifies which SAM Action Table (see Section 4.1.3.) will be executed when the Tone Decoder Target matches the sequence of received tones. If the Action Table field is set to BLANK then no SAM Action Table will be executed. A current SAM Action Table number or a SAM

Action Table number that is one greater than the current number of existing SAM Action Tables may be entered (there is a maximum of 20 SAM Action Tables). If a SAM Action Table is entered that does not exist then the user will get a prompt to create an empty SAM Action Table or a duplicate SAM Action Table. After the SAM Action Table is created the user will be automatically taken to the SAM Action Table screen to edit the table.

## **Group**

The Group field defines which group calling method has to be used with the Target. The SAM board supports two group calling methods, Standard and Expanded. Selection of the group calling method is done by the Up/Down arrow keys. This field may be toggled between the following values: N (None), S (Standard) and E (Expanded). If 'S' is selected then the Group Target requires the following standard rule: Once the Group Tone (defined in the SAM Tone Decode screen for each tone decoder scheme) is detected, all following tones in the target must also be group tones for a Group Target match to occur. The start of a group tone sequence can be at any location in the Group Target. If 'E' is selected then group tones can occur at any location in the Group Target. If 'N' is selected then no group calling method is used and it is not possible to execute a Group Action table.

## **Gr Tar (Group Target)**

The Group Target field specifies where group tones should appear in the Target for a match to occur. If a match occurs then the Group Action table is executed. The tone that is to represent the group tone ('G') is defined in the SAM Tone Decode screen. The letter 'G' indicates where a group tone is to appear in the Target, and a '-' indicates the position where no group tones are to appear. If Group is set to 'S' then only group tones should appear after the first group tone. Example: Target = '12345', Group = 'S' then Group Target = '- - GGG' is valid but Group Target = '- - GG -' is invalid. If Group is set to 'E' then group tones may appear anywhere in the Group Target. Example: Target = '12345', Group = 'E' then Group Target = '- GG - G' is valid.

Example of a Group Target match: Target = '12345', Group = 'S', Group Target = '- - GGG' and the group tone is defined as tone# 9. If the tone sequence sent is '12999' then there is a group target match. If the tone sequence sent is '12995' or '13999' then there is no match. If there is a Group Target match then the Group Action table is executed.

## **Gr Act Tbl (Group Action Table)**

The Group Action Table field specifies which SAM Action Table (see Section 4.1.3.) will be executed when the Group Target matches the sequence of received tones (see Group Target for an example). If the Group is set to 'S' or 'E' then a SAM Action Table must be entered. If the Group is set to 'N' then '- -' must be entered. If the Action Table field is set to '- -' then no SAM Action Table will be executed. A current SAM Action Table number or a SAM Action Table number that is one greater than the current number of existing SAM Action Tables may be entered (there is a maximum of 20 SAM Action Tables). If a SAM Action Table is entered that does not exist then the user will get a prompt to create an empty SAM Action Table or a duplicate SAM Action Table. After the SAM Action Table is created the user will be taken to the SAM Action Table screen to edit the table.

<b>MOTOROLA RADIO SERVICE SOFTWARE</b> <b>SAM with QUANTAR/QUANTRO</b> <b>PAGE 2 Of 3</b> <b>SAM DECODER SELECTION</b>					<b>&lt;MESSAGE CORRESPONDS TO CURRENT FIELD&gt;</b>				
<b>BINARY DECODER</b> <b>BINARY INPUT</b>					<b>MDC1200</b> <b>RECEIVER 1</b>		<b>SAM MODE# 01 of 02</b>		
<b>BINARY DECODER TARGET#</b>					<b>OPCODE</b>		<b>ID</b>		<b>ACT TBL</b>
01 . . . . .					REPEAT ACC		0001		01
02 . . . . .					REPEAT ACC		0002		03
03 . . . . .					REPEAT ACC		0003		04
04 . . . . .									
05 . . . . .									
06 . . . . .									
07 . . . . .									
08 . . . . .									
09 . . . . .									
10 . . . . .									
11 . . . . .									
F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
HELP					ADD SAM MODE		ACTION EDIT		EXIT

Figure 4.3: SAM Decoder Selection Screen #2

### Binary Decoder

The Binary Decoder field indicates if a Binary Decoder scheme will be used in the current SAM mode. The field may be toggled between DISABLED and MDC1200 by use of the Up/Down arrow keys. The Binary Decoder can only be set to a binary decoding scheme if the Tone Decoder and DTMF decoder are both DISABLED. If the field is toggled to MDC1200 then the MDC1200 binary signalling scheme will be used for decoding the current mode. When the SAM's binary signalling decoder has decoded a message, it will compare this message against a list of user-programmable Binary Decoder Targets. If a match is found, the SAM board will execute one or more actions specified by the Target's corresponding SAM Action Table. If the field is changed to DISABLED then all of the fields associated with the Binary Decoder will be cleared.

### Binary Input

The Binary Input field is non-editable at this time and specifies that the SAM binary decoder will monitor RECEIVER 1.

### Binary Decoder Target

A Binary Decoder Target is a specific binary signalling packet that must be matched to execute a SAM Action Table. There can be a maximum of 11 Binary Decoder Targets for the Binary Decoder. A Binary Decoder Target consists of the following fields: OPCODE, ID and ACT TBL (Action Table). These fields are defined below.



## Opcode

The following Opcode field choices may be selected by use of the Up/Down arrow keys: SETUP, KNOCKDOWN, PTT (Push–To–Talk) or REPEAT ACC (Repeater Access). Please note that only the REPEAT ACC opcode can be used. The SETUP, KNOCKDOWN, and PTT opcodes are not supported by the *Quantar/Quantro* stations. The field may also be toggled to blank, which is not an Opcode. A Target may be cleared by toggling to the blank choice. The following is a description of the REPEAT ACC Opcode field choice:

### REPEAT ACC (Repeater Access)

Used for Automatic Repeater Access. In an Automatic Repeater Access system the Repeater Access codeword is sent on a voice transmission and other user initiated transactions. The Repeater Access codeword is decoded by the repeater and not transmitted. When a mobile keys up and sends a REPEAT ACC opcode followed by the matching ID, repeater operation will be enabled as long as all repeater qualifiers are present. The above operation is accomplished by the default Action Tables for this opcode, #01 and #02.

## ID

The ID field contains the ID of the repeater that is to be accessed. Every repeater has its own unique four digit ID. This ID is set up by the system designer or the customer. For example, it may be the last four digits of the serial number. The valid range for the ID field is from 0000 – FFFF.

### Act Tbl (Action Table)

The Action Table field specifies which SAM Action Table (see Section 4.1.3.) will be executed when the current Opcode and ID match the received binary signalling word. If the Action Table field is set to BLANK then no SAM Action Table will be executed. A current SAM Action Table number or a SAM Action Table number that is one greater than the current number of existing SAM Action Tables may be entered (there is a maximum of 20 SAM Action Tables). If a SAM Action Table is entered that does not exist then the user will get a prompt to create an empty SAM Action Table or a duplicate SAM Action Table. After the SAM Action Table is created the user will be shown the SAM Action Table screen to edit the table.



<b>MOTOROLA RADIO SERVICE SOFTWARE</b> <b>SAM with QUANTAR/QUANTRO</b> <b>PAGE 3 Of 3</b> <b>SAM DECODER SELECTION</b>					<b>&lt;MESSAGE CORRESPONDS TO CURRENT FIELD&gt;</b>				
DTMF DECODER DTMF INPUT					ENABLED RECEIVER 1		SAM MODE# 01 of 02		
DTMF DECODER TARGET#					TARGET		ACT TBL		
01 . . . . .					123456789A		01		
02 . . . . .					X123##12		03		
03 . . . . .					1234		04		
04 . . . . .									
05 . . . . .									
06 . . . . .									
07 . . . . .									
08 . . . . .									
09 . . . . .									
10 . . . . .									
11 . . . . .									
F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
HELP					ADD SAM MODE		ACTION EDIT		EXIT

Figure 4.4: SAM Decoder Selection Screen #3

### DTMF Decoder

The DTMF Decoder field indicates if a DTMF Decoder scheme will be used in the current SAM mode. The field may be toggled between DISABLED and ENABLED by use of the Up/Down arrow keys. The DTMF Decoder can only set to ENABLED if the Tone Decoder and Binary Decoder are both DISABLED in the current SAM mode. If the field is toggled to ENABLED, the DTMF signalling scheme will be used for decoding in the current mode. When the SAM's DTMF signalling decoder has decoded a message, it will compare this message against a list of user-programmable Targets. If a match is found, the SAM board will execute one or more actions specified by the matching Target's corresponding SAM Action Table. If the field is changed to DISABLED then all of the fields associated with the DTMF Decoder will be cleared.

### DTMF Input

The DTMF Input field is non-editable at this time and specifies that the SAM DTMF decoder will monitor RECEIVER 1.

### DTMF Decoder Target

A DTMF Decoder Target is a sequence of DTMF tones that must be matched to execute a SAM Action Table. There can be a maximum of 11 DTMF Decoder Targets for the DTMF Decoder. A DTMF Decoder Target consists of the TARGET and ACT TBL (Action Table) fields.

## **Target**

The Target field defines the sequence of DTMF tones that must be matched to execute the SAM Action Table. Each tone in the sequence is specified by a character on a standard telephone keypad (0 through 9, \*, and #), or a letter from A through D. Each character corresponds to a particular pair of frequencies. This correspondence is defined in the SAM Tone Decode Table screen (see Section 4.1.5.). Each Target is allowed a maximum of ten characters. Wildcards are allowed in place of a specific character and are indicated by an 'X'. The SAM DTMF Decoder will interpret an 'X' as a match for any DTMF tones. For example, the sequences '12345' and '12045' will both match the target '12X45'. To clear the rest of the DTMF Decoder Target# fields it is only necessary to clear the Target field.

**Note:** The order of the Targets is important; longer Targets come first in the list. The RSS will automatically sort the Targets by length.

## **Act Tbl (Action Table)**

The Action Table field specifies which SAM Action Table (see Section 4.1.3.) will be executed when the DTMF Decoder Target matches the sequence of received DTMF tones. If the Action Table field is set to BLANK then no SAM Action Table will be executed. A current SAM Action Table number or a SAM Action Table number that is one greater than the current number of existing SAM Action Tables may be entered (there is a maximum of 20 SAM Action Tables). If a SAM Action Table is entered that does not exist then the user will get a prompt to create an empty SAM Action Table or a duplicate SAM Action Table. After the SAM Action Table is created the user will be shown the SAM Action Table screen to edit the table.

### **4.1.2.2. Definition of SAM Decoder Selection Function Keys**

- F1 – Provides HELP.
- F4 – Delete the current mode.
- F6 – Adds a SAM mode. All fields in the added SAM mode will be initially set to DISABLED or blank.
- F7 – Deletes the current SAM mode. The cursor must be in the SAM mode number field. If the SAM mode is referenced in a 'SELSAMODE' action on any of the SAM Action Tables then the SAM mode cannot be deleted until all references to the SAM mode are removed.
- F8 – If the cursor is in the ACT TBL field and a valid Action Table is entered then that Action Table will be displayed and available for editing.
- F10 – Exit the SAM Decoder Selection screen and return to the View/Edit Menu.

### 4.1.3. SAM Action Tables (F6)

The SAM Action Table Screens (Figure 4.5) contain editable fields for each SAM Action Table. An action is an event that the SAM board initiates. A SAM Action Table is a collection of actions that the SAM board will execute. A SAM Action Table can be executed when a Tone Decoder Target, DTMF Target or Binary Decoder Target is matched in a SAM mode (see Section 4.1.2.) or when a Wildcard Input goes to the Active or Inactive state and there is a defined SAM Action Table for that input (see Section 4.1.4.). In this screen, the user is prompted to type in the SAM Action table number to be edited. If the SAM Action Table was created via the SAM Decoder Selection Screen or the SAM Wildcard Inputs Screen then the Action Table Number field is not editable. There is a maximum of 20 (1–20) SAM Action tables. To add a SAM Action Table it is necessary to enter in a SAM Action Table number that is one greater than the current number of SAM Action Tables that currently exist. Once a SAM Action Table is created it is not possible to delete it. All actions in the Action Table can be deleted, however. Each SAM Action Table can have a maximum of 9 actions.

The <TAB> and <BACK TAB> keys are used to move the cursor through each field of each action. The <ENTER> key is used to advance the cursor to the next action. The <PgUp> and <PgDn> keys are used to move the cursor between pages.

<b>MOTOROLA RADIO SERVICE SOFTWARE</b> <b>SAM with QUANTAR/QUANTRO</b> <b>PAGE 1 Of 2</b> <b>SAM ACTION TABLE</b>					<b>&lt;MESSAGE CORRESPONDS TO CURRENT FIELD&gt;</b>				
ACTION TABLE NUMBER			01		ACTION TABLE# 01 of 04				
#	ACTION	ADDRESS	TARG BIT	POLARITY					
01	MANIBIT	004C	0	ENABLED					
#	ACTION								
02									
#	ACTION								
03									
#	ACTION								
04									
F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
HELP				PRINT PAGE		CLEAR CHANGE TABLE STATES		EXIT	

Figure 4.5: SAM Action Table Screen #1

#### 4.1.3.1. SAM Action Table Field Definitions

The list of valid SAM Action Table actions, along with the associated fields for each action, is shown below. When the ACTION field is changed, the associated headers for that action will appear on the screen.

##### MANIBIT

This action changes the state of any writeable bits at a user–defined Address on the SAM board.

##### Field #      Field Name and Description

Address – Address on the SAM board that contains the bit to be changed. The toggle choices for this field are 004A, 004C, and 004E.

Target Bit – Bit at the user–defined address on the SAM board that is to be changed. Valid range is 0 – 7.

Polarity – Indicates if the bit at user–defined Address and Target Bit position is to be ENABLED or DISABLED. This field may be changed by use of the Up/Down arrow keys.

**WARNING! Do not use or access address 004C Target Bit 02 because it is used for internal diagnostics!!**

## **SELSAMODE**

This action allows selection of a SAM mode, other than the current mode, for a user – defined amount of time.

<u>Field #</u>	<u>Field Name and Description</u>
----------------	-----------------------------------

SAM Mode# – SAM mode number to select. Valid range is 0 to number of SAM modes.

Time – Amount of time the SAM board should stay in the SAM mode. Valid range is 0 – 2550 msec. If set to less than 10 msec, there will be no time limit for the SAM board to stay in the SAM mode.

## **WAIT**

This action holds execution of the following actions within the same action table for a user – defined amount of time.

<u>Field #</u>	<u>Field Name and Description</u>
----------------	-----------------------------------

Wait Time – Amount of time to suspend execution of following actions in the SAM Action Table. Valid range is 10 – 2550 msec.

## **WAITSET and WAITCLEAR**

These actions will trigger continuing execution of an action table depending on the presence of a programmable bit pattern at a user – defined Address within the SAM board Address range. Execution of the rest of the SAM Action Table will be performed only if the data bits at the stated Address match the Mask (masked bits are set if Waitset or masked bits are cleared if Waitclear) and the timer has not expired.

<u>Field #</u>	<u>Field Name and Description</u>
----------------	-----------------------------------

Address – Address of the byte that will be compared to the mask to determine if execution of the action table should continue. The Address corresponds to a unique location on the SAM board. Valid range is 0000 – FFFF.

Mask – This is a programmable bit pattern which is compared to the data bits contained at the Address. If the data bits match the Mask (bits set if WAITSET or clear if WAITCLEAR) then execution of the rest of the action table is performed. Valid range is 00 – FF.

Time – Amount of time that the byte contained at the Address has to match the Mask. If the time expires before a match is made then execution of the following actions in the SAM Action Table are terminated. Valid range is 0 – 655350 msec. If set to less than 10 msec, there will be no time limit for the byte contained at the Address to match the Mask.

**NOTE: The remaining Actions should be used with caution with the QUANTAR/QUANTRO. The following Actions were developed to be used with the SAM in conjunction with MSF 5000/10000 Base Station. Use of these Actions with the QUANTAR/QUANTRO could produce undesired results.**

**TUNEEDPOT**

This action will change the setting of the EEpot on the SAM board by a user-defined amount.

<u>Field #</u>	<u>Field Name and Description</u>
Step Size	– The number of steps that the EEpot on the SAM board will be incremented or decremented. The valid range is –99 to +99.

**SETMUXQUAL**

This action is not supported by *Quantar/Quantro* stations.

**CLRMUXQUAL**

This action is not supported by *Quantar/Quantro* stations.

## GENENSEQ (Generate Encode Sequence) and GENID (Generate Station ID)

This action is not supported by *Quantar/Quantro* stations.

### QUICKKEY

This action allows the next action in the SAM Action Table to be executed/skipped based on the presence/absence of a programmable bit pattern at a user-defined address on the MUXbus. The next action will be skipped if the timer expires before the programmable bit pattern appears on the MUXbus.

<u>Field #</u>	<u>Field Name and Description</u>
----------------	-----------------------------------

MUXaddr	– Address of the data bits on the MUXbus that will be compared to the Mask to determine if the next action should be executed or skipped. Valid range is 0 – 15.
---------	------------------------------------------------------------------------------------------------------------------------------------------------------------------

Mask	– This is a programmable bit pattern which is compared to the data bits contained at MUXaddr. If the data bits match the mask then the next action is executed otherwise the next action is skipped. Valid range is 0 – F.
------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Time	– Amount of time that the data bits contained at the MUXaddr has to match the Mask. If the time expires before a match is made then execution of the following action in the action table is skipped. Valid range is 10 – 655350 msec.
------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

### SETMUX

This action is not supported by *Quantar/Quantro* stations.

### CLEARMUX

This action is not supported by *Quantar/Quantro* stations.



## **SETMUXMOM**

This action is not supported by *Quantar/Quantro* stations.

## **RESSAMODE**

This action is not supported by *Quantar/Quantro* stations.

## **SELCHAN**

This action is not supported by *Quantar/Quantro* stations.

## **SELCHAN2**

This action is not supported by *Quantar/Quantro* stations.

## **SELMODE**

This action is not supported by *Quantar/Quantro* stations.



#### **4.1.3.2. Definition of SAM Action Function Keys**

- F1 – Provides HELP associated with the SAM action field.
- F5 – Print the current page.
- F7 – Clears all of the actions associated with the current SAM Action Table.
- F8 – Only available when the SAM Action Table screen is entered via the SAM Wildcard Input screen. Allows user to change between the Active and Inactive SAM Action Table if they are defined.
- F10 – Exit the SAM Action table and return to the View/Edit Menu.



#### 4.1.4. SAM Wildcard Inputs (F7)

The SAM Wildcard Inputs screen (Figure 4.6) defines 16 Wildcard Input lines. Each Wildcard Input contains the following fields: Input Type, Active, Active Action Table and Inactive Action Table. These fields are described below.

<b>MOTOROLA RADIO SERVICE SOFTWARE</b> <b>SAM with QUANTAR/QUANTRO</b> <b>PAGE 01 Of 02</b> <b>SAM WILDCARD INPUTS</b>					<b>&lt;MESSAGE CORRESPONDS TO CUR-          RENT FIELD&gt;</b>				
I/O CONFIGURATION		WILDCARD							
WILDCARD INPUT	INPUT TYPE	ACTIVE			ACTIVE ACT TBL			INACTIVE ACT TBL	
0									
1									
2									
3									
4									
5									
6									
7									
8	WILDCARD LOW							02	
9									
10									
F1 HELP	F2	F3	F4	F5	F6	F7	F8 ACTION EDIT	F9	F10 EXIT

Figure 4.6: SAM Wildcard Input Menu

##### I/O Configuration

The I/O Configuration field is non–editable and displays WILDCARD.

##### Input Type

The Input Type field describes how the Wildcard Input has been configured. This field is edited by use of the Up/Down arrow keys. The toggle choices are WILDCARD or blank.

##### Active

The Active field determines if the Wildcard Input is Active High or Active Low. This field may be toggled between the following values: HIGH and LOW. When the Wildcard Input makes a transition to its Active state then the Active Action Table will be executed, if it is defined (not BLANK). When the Wildcard Input makes a transition to its Inactive State then the Inactive Action Table will be executed, if it is defined (not BLANK).

### **Active Action Table**

The Active Action Table field describes which Action Table will be executed whenever a Wildcard Input makes a transition to its Active state. If the Action Table field is set to BLANK then no Action Table will be executed. If the Input Type field is set to BLANK then this field is non-editable. A current Action Table number or an Action Table number one greater than the current number of existing Action Tables may be entered (valid entries for this field are displayed in the message window). If an Action Table number is entered that does not exist and the Inactive Action Table is set to BLANK then the user will get a prompt to create an empty Action Table or a duplicate Action Table. After the Action Table number is entered the user will be taken to the Action Table screen to edit the Action Table. If an Action Table number is entered that does not exist and the Inactive Action Table is not set to BLANK then the user will get a prompt to create an empty Action Table, duplicate Action Table or a copy of the Inactive Action Table. After the Action Table number is entered the user will be taken to the Action Table screen to edit the Action Table.

**Note:** If an Active Action table is entered it is recommended that an Inactive Action Table also be entered to cancel the actions executed by the Active Action table.

### **Inactive Action Table**

The Inactive Action Table field describes which Action Table will be executed whenever a Wildcard Input makes a transition to its Inactive state. If the Action Table field is set to BLANK then no Action Table will be executed. The Inactive Action Table usually contains actions to do the opposite of the Active Action Table. If the Input Type field is set to BLANK then this field is non-editable. A current Action Table number or an Action Table number one greater than the current number of existing Action Tables may be entered (valid entries for this field are displayed in the message window). If an Action Table number is entered that does not exist and the Active Action Table is set to BLANK then the user will get a prompt to create an empty Action Table or a duplicate Action Table. After the Action Table number is entered the user will be taken to the Action Table screen to edit the Action Table. If an Action Table number is entered that does not exist and the Active Action Table is not set to BLANK then the user will get a prompt to create an empty Action Table, duplicate Action Table or a copy of the Active Action Table. After the Action Table number is entered the user will be taken to the Action Table screen to edit the Action Table.

#### **4.1.4.1. Definition of SAM Wildcard Inputs Function Keys**

- F1 – Provide help.
- F5 – Print the current page.
- F8 – If in the Active or Inactive Action Table field and a valid Action Table is entered then that Action Table will be displayed and available for editing. See section on Editing SAM Action Tables from SAM Wildcard Input Screen.
- F10 – Exit the Wildcard Input Menu and return to the View/Edit Menu.

#### 4.1.5. SAM Tone Decoder Tables (F8)

The screen shown below allows entry into the SAM Tone Decoder Table screen. There are eight possible tone schemes: ZVEI, ZVEIMOD, ZVEIFR, CCIR, CCIRMOD, EEA, CUSTOM, and DTMF. CUSTOM is the only scheme that is completely editable. The tone schemes are listed on a submenu of the F8 selection from the SAM menu. The list of tone schemes may be tabbed through, or UP/DN Arrow, and the corresponding information will be displayed upon pressing Enter. Upon returning from any particular tone scheme, the cursor will automatically advance to the next tone scheme in the list.

MOTOROLA RADIO SERVICE SOFTWARE SAM with QUANTAR/QUANTRO					<MESSAGE CORRESPONDS TO CURRENT FIELD>				
INDIVIDUAL SCHEMES									
<u>      TONE DECODER SCHEMES      </u>  ZVEI ZVEIMOD ZVEIFR CCIR CCIRMOD EEA CUSTOM DTMF									
F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
HELP				PRINT PAGE					EXIT

Figure 4.7: Individual Schemes screen

For all Tone schemes the following information will be present: scheme name, frequencies 0 – E, tone duration (except CUSTOM), first TOT, following TOT, repeat tone and group tone. For all schemes except CUSTOM, which is completely editable, only the following are editable: first TOT, repeat tone and group tone. The bandwidth field is an editable field unique to the CUSTOM scheme.

For the DTMF scheme the following information will be present: scheme name, tones and corresponding frequency pairs, and DTMF Inter–tone Gap. Only the Inter–tone Gap and Decoder TOT fields are editable.

MOTOROLA RADIO SERVICE SOFTWARE SAM with QUANTAR/QUANTRO					<MESSAGE CORRESPONDS TO CUR- RENT FIELD>				
TONE DECODE TABLES									
TONE DECODER ZVEI									
TONE #	FREQUENCY Hz			TONE #	FREQUENCY Hz				
0	2400			8	2000				
1	1060			9	2200				
2	1160			A	2800				
3	1270			B	0810				
4	1400			C	0970				
5	1530			D	0886				
6	1670			E	2600				
7	1830								
Decoder TOT of First Tone				120 msec	Dec Repeat Tone			E	
Decoder TOT of Succeeding Tones				120 msec	Decoder Group Tone			A	
F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
HELP				PRINT PAGE					EXIT

Figure 4.8: Tone Decode Table for ZVEI scheme

## Bandwidth

The Bandwidth field will only appear for the CUSTOM scheme. The valid range is 0 to 9.99 percent. It is the percent bandwidth allowed during tone detection. To avoid aliasing, lower percent values are recommended. The value of this field is not stored in the codeplug. It is used to calculate the DELTA values for the CUSTOM scheme. This field is calculated upon entering and may therefore be slightly different in value than what was typed in previously.

## Tone Frequencies

The tone frequencies valid range is 600 to 3300 Hz. These are only editable for the CUSTOM scheme. These frequencies are the center frequencies used in tone detection.

## Decoder TOT of First Tone

This field is the amount of time that the station waits until trying to detect the tone following the first tone. The valid range is 70 to 290 msec. The valid range for the CUSTOM scheme is 0 to 655350 msec. Default for ZVEI, ZVEIMOD and ZVEIFR is 120 msec. Default for CCIR is 170 msec. Default for EEA and CCIRMOD is 70 msec.

## Decoder TOT of Succeeding Tones

This is the amount of time that the station waits until trying to detect all succeeding tones. The valid range is 70 to 290 msec. The valid range for the CUSTOM scheme is 0 to 655350 msec. Default for

CCIRMOD, ZVEI, ZVEIMOD and ZVEIFR is 120 msec. Default for CCIR is 170 msec. Default for EEA is 100 msec. This field is only editable for the CUSTOM scheme.

### Dec Repeat Tone

The Repeat Tone is the tone that is substituted when identical tones are to be decoded. For example, if the following tones were to be decoded '12234', and the Repeat Tone was A then the sequence of tones would be '12A34'. The valid range is 0 – E.

### Decoder Group Tone

The Group Tone is the tone that is used by the Group Target field in the SAM mode (see Section 4.1.2.1.). The Target must be matched as defined on the SAM mode for a Group Action table to be executed. The valid range is 0 – E.

MOTOROLA RADIO SERVICE SOFTWARE SAM with QUANTAR/QUANTRO				<MESSAGE CORRESPONDS TO CUR- RENT FIELD>					
DECODE TABLES									
DTMF DECODER									
TONE	PAIRS	TONE	PAIRS	TONE	PAIRS	TONE	PAIRS		
#	Hz	#	Hz	#	Hz	#	Hz		
D	0941 1633	4	0770 1209	8	0852 1336	#	0941 1477		
1	0697 1209	5	0770 1336	9	0852 1477	A	0697 1633		
2	0697 1336	6	0770 1477	0	0941 1336	B	0770 1633		
3	0697 1477	7	0852 1209	*	0941 1209	C	0852 1633		
DTMF Inter—Tone Gap 0050 msec									
DTMF Decoder TOT 003000 msec									
F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
HELP				PRINT PAGE					EXIT

### DTMF Tone Pairs

Each character of the DTMF scheme corresponds to a pair of frequencies. The characters are 0 through 9, A through D, \*, and #. The corresponding frequencies range from 600 to 3300 Hz.

### DTMF Inter–Tone Gap

This field defines the length of the pause between two DTMF tones. The valid range is 50 to 21100 msec. The default is 50 msec.

## **DTMF Decoder TOT**

This field defines the maximum amount of time that the DTMF Decoder will wait from the detection of a DTMF tone and the detection of the following tone in a sequence. The valid range is 10–655350 msec. The default is 3000 msec.

### **4.1.5.1. Definition of SAM Tone Decode Table Function Keys**

F1 – Provides HELP associated with the SAM Tone Decode field.

F5 – Print the current page.

F10 – Exit the SAM Tone Decode Table and return to the View/Edit Menu.



# APPENDIX A – GLOSSARY

<b>Adjustment</b>	Means rough tuning of the station to a specified value.
<b>Archive File</b>	Computer disk file that contains the codeplug data of a particular station.
<b>Arrow Keys</b>	The keys that control the cursor and adjustment functions of the software.
<b>Automatic Access</b>	A trunking software option that allows conventional repeaters to react to interrogations by trunking subscribers.
<b>Backup Files</b>	A copy of the archive files that are used in event that the original archive files are lost or erased.
<b>Base</b>	A type of station that does not transmit while receiving.
<b>BSC</b>	Base Station Controller is an enhanced GCC board.
<b>Calibration</b>	The precise method of tuning the station over its entire band spread.
<b>Call Sign</b>	The FCC–assigned ID of the licensee.
<b>Carrier Squelch</b>	A station receive or transmit mode of operation that used receiver squelch as the only method of muting the speaker.
<b>Channel</b>	A pair of receive and transmit frequencies.
<b>Codeplug</b>	The area of non–volatile station memory that stores the station configuration and calibration data.
<b>Com 1 – Com 4</b>	The names of the four serial ports available on IBM PC computers (if the computer is so equipped).
<b>Crystal Aging</b>	The drift of the resonant frequency of a crystal with time.
<b>CSQ</b>	Abbreviation of carrier squelch.
<b>CT</b>	Connect Tone.
<b>Cursor</b>	Flashing underline or block which shows the display location of the next character to be typed from the keyboard.
<b>Defaults</b>	Standard settings the Service Software uses for I/O port locations, file locations and display settings.
<b>Dekey</b>	Turn the transmitter off (remove push–to–talk).
<b>Deviation</b>	The measure of the amount of modulation applied to a transmitter signal.
<b>Disk Drives</b>	Magnetic media that the computer uses to store files.
<b>Display</b>	The CRT terminal that the computer displays information on.
<b>DOS</b>	Abbreviation of Disk Operating System or abbreviation of Data Operated Squelch.



<b>DPL</b>	Abbreviation of Digital Private Line, one form of coded squelch.
<b>DVM</b>	Abbreviation of Digital Volt Meter
<b>EEPROM</b>	Electronically Erasable Programmable Read Only Memory. Used by the station's microcomputer system to store the station's codeplug data.
<b>External EEPROM</b>	An EEPROM outside of that contained in the MC68HC11 micro-processor.
<b>Failsoft</b>	A trunking mode that is entered when the Trunking Central Controller is not functional.
<b>Field</b>	A highlighted area on the computer display used to display keyboard entered data.
<b>Files</b>	Information that is saved on the computer disk drive. One file represents the codeplug data for one station.
<b>Floppy Disk Drive</b>	A disk drive that used removable magnetic disks. Service Software, Archive and Backup files are stored on these disks.
<b>Full Duplex</b>	This is the ability to simultaneously receive and transmit wireline audio.
<b>Function Keys</b>	The ten keys located on the PC keyboard labeled F1 to F10.
<b>Hard Disk Drive</b>	A disk drive that used a solid nonremovable magnetic disk. Service Software, Archive and Backup files are stored on these disks.
<b>Key</b>	Either refers to a button on the computer's keyboard or turning the transmitter to the on position.
<b>Menu</b>	A list of functions that are accessed by pressing a function key.
<b>MRSS</b>	Motorola Radio Service Software.
<b>MSDOS</b>	Abbreviation of MicroSoft Disk Operating System (MSDOS is a trade mark of MicroSoft Inc.).
<b>PCDOS</b>	Abbreviation of Personal Computer Disk Operating System (PCDOS is a trademark of IBM Inc.).
<b>PL</b>	Abbreviation of Private Line, a form of coded squelch.
<b>Popwarning</b>	A window that appears on the RSS screen to warn the user of an abnormal situation or entry. A Popwarning typically has options to continue or abort the changes the user is currently making.
<b>Port</b>	A hardware interface that the computer uses to communicate with other devices.
<b>PTT</b>	Push-to-Talk indicates that the station is transmitting.
<b>RAM</b>	Abbreviation of Random Access Memory. The computer uses RAM to store the program it executes.
<b>Repeater</b>	A type of station that transmits its receiver audio.
<b>RF</b>	Radio Frequency.
<b>RMS</b>	Root Mean Square Unit of amplitude measure for AC waveforms.

<b>RSS</b>	Radio Service Software.
<b>SAM</b>	Station Access Module is a board that allows selection of individual repeaters in a multiple repeater system by use of a repeater ID, use of smart Wildcard Inputs and Outputs and remote diagnostics.
<b>Screen</b>	A program generated display showing on the computer monitor.
<b>Simulcast</b>	This indicates that multiple stations can transmit on the same RF frequency at the same time.
<b><i>Spectra – TAC</i></b>	A type of system that contains multiple receivers, one of whose audio is selected for re – transmission.
<b>Squelch</b>	A station circuit which eliminates noise from the loudspeaker when a received signal is not present.
<b>Synthesizer</b>	The frequency generating unit of a station.
<b>Tree</b>	A way to describe the organization of the Radio Service Software. The Main Menu is considered the trunk and the functions listed on the menu are considered branches.
<b>Trunking</b>	A type of system that assigns and de – assigns RF channels to users as they are needed.
<b>Window</b>	One of the four portions of the screen.



## APPENDIX B – COMMAND SUMMARY

Key	Action
<b>F1</b>	Help Information
<b>F10</b>	Exit to previous Menu
<b>ESC</b>	Exit to MAIN MENU
<b>▶</b>	Right Arrow moves cursor right
<b>◀</b>	Left Arrow moves cursor left
<b>▲</b>	Up Arrow changes current Data Entry Field to the previous selection in a list of predetermined choices on DATA ENTRY SCREENS.
<b>▼</b>	Down Arrow changes current Data Entry Field to the next selection in a list of predetermined choices on DATA ENTRY SCREENS.
<b>&lt; – (Enter)</b>	Enters data typed and moves to next Data Entry Field
<b>--&gt;  </b>	Forward Tab moves to the next Data Entry Field.
<b>  &lt; --</b>	Back Tab (also known as Shift/Tab) moves to the previous Data Entry Field.
<b>&lt; -- (backspace)</b>	Erase the current character in field and move cursor one character left.
<b>Del</b>	Erase current character in field.
<b>PgUp</b>	Display the previous page of information on DATA ENTRY SCREENS.
<b>PgDn</b>	Display the next page of information on DATA ENTRY SCREENS.

# APPENDIX C – REPEATER ACCESS USING THE SAM BOARD IN THE QUANTAR OR QUANTRO STATION

To setup the SAM board for Repeater Access, first load the default SAM codeplug, RAC.DEF from disk. (This is the same as the default factory programming.) The default codeplug contains the following default Action Tables as shown below.

Action Table Number	01	Action Table #01 of 05		
#	Action	Address	Targ Bit	Polarity
01	MANIBIT	004C	0	ENABLED

Action Table Number	02	Action Table #02 of 05		
#	Action	Address	Targ Bit	Polarity
01	MANIBIT	004C	0	DISABLED

Action Table Number	03	Action Table #03 of 05		
#	Action	Address	Targ Bit	Polarity
01	MANIBIT	004C	1	ENABLED

Action Table Number	04	Action Table #04 of 05		
	Action	Address	Targ Bit	Polarity
01	MANIBIT	004C	1	DISABLED
02	MANIBIT	004C	0	DISABLED

Action Table Number	05	Action Table #04 of 05		
	Action	Address	Targ Bit	Polarity
01	MANIBIT	004C	0	DISABLED
02	MANIBIT	004C	1	DISABLED
03	MANIBIT	004C	2	DISABLED
04	MANIBIT	004C	3	DISABLED
05	MANIBIT	004C	4	DISABLED
06	MANIBIT	004C	5	DISABLED
07	MANIBIT	004E	3	DISABLED
08	MANIBIT	004E	4	DISABLED

Action Tables 1 and 2 are required to allow SAM to communicate with the station for the basic Automatic Repeater Access function. Action Table 1 provides the RPTR PTT qualifier RPT\_ACC\_EN to allow the station to repeat on receipt of the access code. Wildcard Input 8 and Action Table 2 allow

Action Table 3 provides the RPTR PTT qualifier RPTR\_EN on receipt of the Repeater Setup code. This will allow repeat without the Repeater Access code until the Knockdown code is sent.

Action Table 4 removes the RPTR PTT qualifier RPTR\_EN on receipt of the Repeater Knockdown code.

Action Table 5 returns bits 0 through 5 of address 004C and bits 3 and 4 of address 004E to their DISABLED polarities upon activation of Wildcard Input 15. Wildcard Input 15 becomes active upon a SAM reset.

**WARNING! Do not use or access address 004C Target Bit 02 because it is used for internal diagnostics!!**

WILDCARD INPUT	INPUT TYPE	ACTIVE	ACTIVE ACT TBL	INACTIVE ACT TBL
8	WILDCARD	LOW		02
15	WILDCARD	LOW	05	

(Refer to the flow chart on the facing page) Analog repeat operation of the *Quantar/Quantro* stations is controlled by setting the appropriate parameters on the *Quantar/Quantro* RSS Channel Information screen. The parameters on this screen which control repeat operation are S (Carrier) and C (PL/DPL), both of which are choices in the *Analog Rptr Activation* field. These parameters can be used individually to enable repeat operation or they can be used as an AND function requiring both parameters (SC in the *Analog Rptr Activation* field) to be present as a qualifier for the repeat operation.

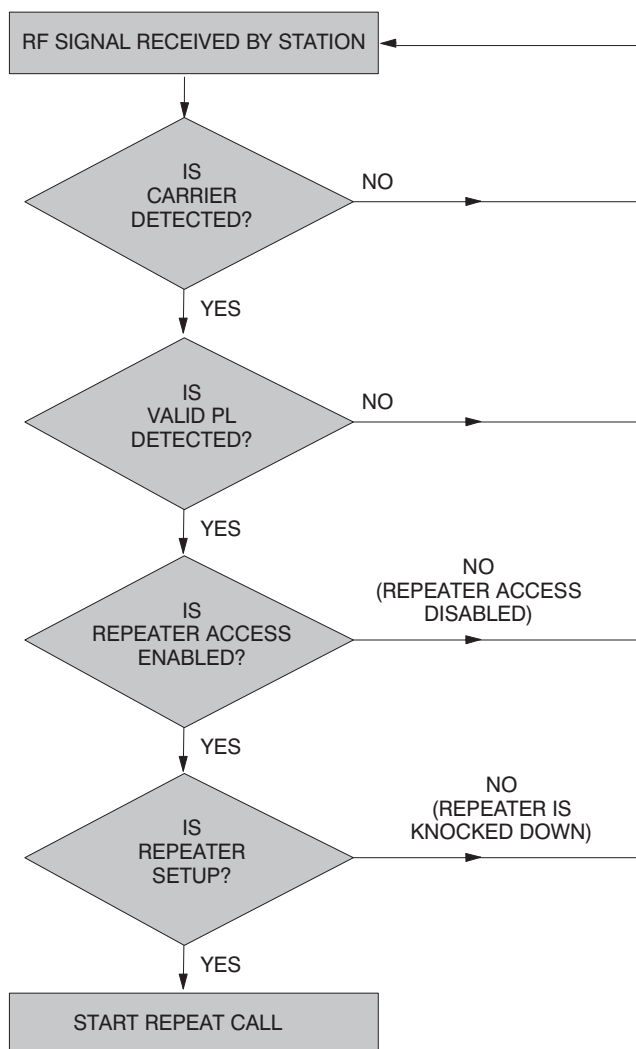
The screen also provides a third parameter which can be used to control analog repeater operation. This parameter (*Analog Rptr Access*) can be set to **MDC/TONE** or **OFF**. When the parameter is set **OFF**, only Carrier and PL/DPL are used to qualify a repeat transmission. When the parameter is set to **MDC/TONE**, the station requires that the SAM also allow the repeat transmission to occur. SAM allows the repeat session to occur by setting the appropriate bits to the *Quantar* Station Control Module. These bits are set and cleared by the action tables described in the sections to follow.

Repeater Access is controlled by SAM only if the *Analog Rptr Access* field is set to **MDC/TONE**. This parameter can be set individually on a per channel basis. The user may, at his discretion, allow SAM to control the repeat function on some channels but not others. This repeat gating function applies only to analog calls. *ASTRO* calls are not affected by this parameter.

**Note** Regardless of the functionality required by the Quantar/SAM combination, at least one channel must be configured with the Analog Rptr Access set to MDC/TONE. The Quantar station will not recognize that SAM is installed and the station will not initialize SAM unless at least one channel is configured with Analog Rptr Access set to MDC/TONE. If SAM is not initialized, it will not detect any MDC or tone signaling sequence.

### Analog Repeat Call Flow Prerequisites

- Analog Rptr Activation RSS Parameter set to SC
- Emergency conditions exist, in which non-Local Subscribers are using “Secondary” PL



Typical Call Flow Chart With Repeater Access Incorporated

## FOR AUTOMATIC ANALOG REPEATER ACCESS:

Analog repeater operation of the station is disabled by the default setting of the same action tables. In order to allow analog repeater operation, i.e. access the repeater, subscriber radios and/or dispatch equipment automatically send a signalling sequence at the beginning of every transmission. The sequence will cause the station to allow analog repeater operation for the duration of the transmission. The signalling sequence can be an MDC1200 sequence, a Select V sequence or a DTMF sequence. The following is an example of how the SAM board would be programmed to do Automatic Analog Repeater Access using MDC1200 signalling.

BINARY DECODER	MDC1200	SAM MODE #01 of 01		
BINARY INPUT	RECEIVER 1			
BINARY DECODER TARGET#	OPCODE	ID	ACT TBL	
01	REPEAT ACC	0000	01 (Repeat Enable)	

The following is an example of how the SAM board would be programmed to do Automatic Analog Repeater Access using a ZVEI Select V signalling.

BINARY DECODER	ZVEI	SAM MODE #01 of 01			
TONE INPUT	RECEIVER 1				
TONE DECODER TARGET#	ACT TBL	GROUP	GR TAR	GR ACT TBL	
01	1234	01	N	----- --	

The following is an example of how the SAM board would be programmed to do Automatic Repeater Access using DTMF signalling.

DTMF DECODER	ENABLED	SAM MODE #01 of 01	
DTMF INPUT	RECEIVER 1		
DTMF DECODER TARGET#	TARGET	ACT TBL	
01	1234567890	01	

## FOR ANALOG REPEATER ACCESS ENABLE/DISABLE

Analog repeater operation to the station is disabled by the default setting of the SAM action tables. In order to allow analog repeater operation, subscriber radios and/or dispatch equipment manually send a signalling sequence via a dedicated button. The sequence will cause the station to allow repeater operation indefinitely. The signalling sequence can be an MDC1200 sequence a Select V sequence or a DTMF sequence. A second dedicated button will generate a different signalling sequence which disables repeater operation.

Repeater Access *Disable* means that repeater operation is disabled unless SAM is programmed for Automatic access, as described above, and the mobile is able to send the programmed sequence. Re-



peater Access *Enable* means that analog repeater operation is enabled requiring only the proper repeater qualifiers.

The following is an example of how the SAM board would be programmed to do Repeater Access Enable/Disable using MDC1200 signalling. MDC1200 ID 0000 is used to trigger Repeater Access Disable, while ID 0001 is used to trigger Repeater Access Enable.

BINARY DECODER	MDC1200	SAM MODE #01 of 01		
BINARY INPUT	RECEIVER 1			
BINARY DECODER TARGET#	OPCODE	ID	ACT TBL	
02	REPEAT ACC	0000	03 (Rptr Access Enable)	
03	REPEAT ACC	0001	04 (Rptr Access Disable)	

The following is an example of how the SAM board would be programmed to do Repeater Access Enable/Disable using a ZVEI Select V signalling.

BINARY DECODER	ZVEI	SAM MODE #01 of 01			
TONE INPUT	RECEIVER 1				
TONE DECODER TARGET#	ACT TBL	GROUP	GR TAR	GR ACT TBL	
02	23456 02	N	-----	--	
03	34567 03	N	-----	--	

The following is an example of how the SAM board would be programmed to do Repeater Access Enable/Disable using DTMF signalling.

DTMF DECODER	ENABLED	SAM MODE #01 of 01	
DTMF INPUT	RECEIVER 1		
DTMF DECODER TARGET#	TARGET	ACT TBL	
02	1234567890	03 (Repeater Access Enable)	
03	6789012345	04 (Repeater Access Disable)	

## CONTROL OF REPEATER SETUP AND KNOCKDOWN VIA SAM

SAM can be used to control the Repeater SETUP and KNOCKDOWN states of the Quantar station. In order to implement this function, the following tables need to be added to the codeplug. These tables are not included in the default codeplug. Note that the station's Repeater SETUP and KNOCKDOWN states control both the analog and digital repeat function, whereas the Repeater Access Enable/Disable states control the analog repeat function.

### Action Tables

Action Table Number XX					
Entry #	Action	Address	Target Bit	Polarity	Function
01 02 03	Manibit	004C	3	Disable	Repeater SETUP

Action Table Number YY					
Entry #	Action	Address	Target Bit	Polarity	Function
01 02 03	Manibit	004C	3	Enable	Repeater KNOCKDOWN

These tables can be triggered by either MDC, DTMF, or some other tone sequence supported by SAM, as shown in the following three examples.

#### For MDC:

BINARY DECODER	MDC1200	SAM MODE #01 of 01			
BINARY INPUT	RECEIVER 1				
BINARY DECODER TARGET#	OPCODE	ID	ACT TBL		
01	REPEAT ACC	0001	XX (Rptr SETUP)		
02	REPEAT ACC	0002	YY (Rptr KNOCKDOWN)		

#### For DTMF:

DTMF DECODER TARGET#	TARGET	ACT TBL			
01	147*	XX (Rptr SETUP)			
02	369#	YY (Rptr KNOCKDOWN)			

#### For Tones:

TONE DECODER TARGET#	ACT TBL	GROUP	GR	TAR	GR	ACT TBL
01	12345	XX (SETUP)	N	-----		--
02	67890	YY (KNOCKDOWN)	N	-----		--

## APPENDIX D – WILDCARD OUTPUT MAP

To access the Wildcard Outputs, an Action Table must be set up. In the Action Table, the MANIBIT function is used to specify which Wildcard Output will be set or cleared. WAIT statements may be used to cause an output to be set for a period of time before the next action in the table clears the output.

The Wildcard Output states are specified in 3 codeplug bytes. In the Action Table, ENABLE will set the output active and DISABLE will set the output inactive.

All Wildcard Outputs are Active Low.

Wildcard Output	Address Byte	Bit #	Wildcard Output	Address Byte	Bit #	Wildcard Output	Address Byte	Bit #
0	004A	0	8	004C	0	16	004E	0
1	004A	1	9	004C	1	17	004E	1
2	004A	2	10	004C	2	18	004E	2
3	004A	3	11	004C	3	19	004E	3
4	004A	4	12	004C	4	20	004E	4
5	004A	5	13	004C	5	21	004E	5
6	004A	6	14	004C	6	22	004E	6
7	004A	7	15	004C	7	23	004E	7

## APPENDIX E – CABLING DIAGRAMS

The following diagrams show the proper cabling from standard IBM Compatible 9 and 25 pin RS232 serial port D–connectors to the SAM 9 pin RS232 port. The sex specified for each connector refers to the sex of the connector on the cable, **not** the sex of the connectors on the IBM or SAM.

9 Pin IBM to 9 Pin SAM			
SAM 9 Pin Male D–Connector		IBM 9 Pin Female D–Connector	
Signal Name	Pin	Signal Name	Pin
Rx	2	Tx	3
Tx	3	Rx	2
Signal Ground	5	Signal Ground	5

25 Pin IBM to 9 Pin SAM			
SAM 9 Pin Male D–Connector		IBM 25 Pin Female D–Connector	
Signal Name	Pin	Signal Name	Pin
Rx	2	Tx	2
Tx	3	Rx	3
Signal Ground	5	Signal Ground	7